ORDER NO. VRD-7807-300

Service Manual

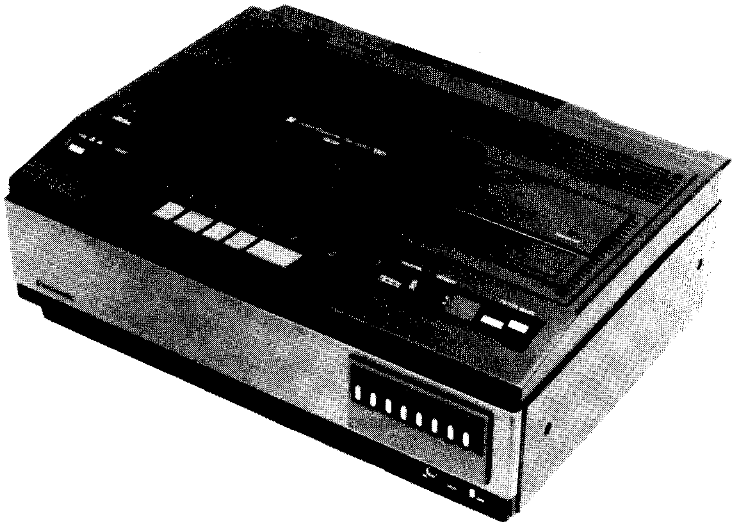
Video Cassette Recorder

Vol. 1

Panasonic VHS™

Summary
Technical Descriptions

NV-8600-E -B



SPECIFICATIONS

NV-8600-E (EUROPE)
NV-8600-B (ENGLAND)
Power Source: 220, 240 V AC, 50 Hz/60 Hz
Power Consumption: Approx. 30 watts
Television System: CCIR: 625 lines, 50 fields
PAL colour signal
Video Recording System: 2 rotary heads, helical scanning system
Luminance: FM azimuth recording
Colour signal: converted subcarrier phase shift recording
Audio Track: 1 track
Tape Format: Tape width 12.7 mm high density tape
Tape Speed: 23.39 mm/s
Record/Playback Time: 180 min. with NV-E180
FF/REW Time: Less than 4.5 min. with NV-E180
Heads: Video: 2 rotary heads
Audio/Control: 1 stationary head
Erase: 1 full track erase
Input Level: Video: VIDEO IN jack
1.0 Vp-p, 75 ohm unbalanced
Audio: MIN IN jack
−70 dB, 600 ohm unbalanced
LINE IN jack
−20 dB, 100 kohm unbalanced

Output Level: Video: VIDEO OUT jack
1.0 Vp-p, 75 ohm unbalanced
Audio: LINE OUT jack
−6 dB, 600 ohm unbalanced
RF Modulated: UHF channel 45 (±2)
73 dB (open voltage),
75 ohm unbalanced
Weight: 17.0 kg
Dimensions: 485(W) × 368(D) × 176(H) mm
Accessories Supplied: 1 pc. Video cassette tape, NV-E120
1 pc. DIN-DIN coaxial cable, VJA0116
1 pc. Dust cover, VYC0028
1 pc. Remote pause control,
NV-A181 Approx. 6 m
Optional Accessories: Video cassette tape:
NV-E180 Approx. 258 m, 180 min.
NV-E120 Approx. 174 m, 120 min.
NV-E60 Approx. 88 m, 60 min.
Video camera, WV-460/E
Microphone

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

Panasonic

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

INTRODUCTION

This Service Manual contains technical information which will allow service technicians to understand and service the Panasonic PAL VHS Video Tape Recorder Model NV-8600.

The NV-8600 has many special features including extended recording time of up to 3 hours, simplified and reliable new tape loading method, a directly driven head cylinder, a rugged and reliable aluminum die-cast chassis, and it is lightweight and very compact.

These features in addition to the basic PAL VHS Format made the NV-8600 an ideal unit for industrial VTR applications.

FEATURES

1. **3-Hour Recording and Playback**

   The PAL VHS Format allows a recording time of up to 3 hours on a single videocassette. (180min. blank tape: NV-E180).

2. **Direct Drive Head Cylinder**

   The Video Head Cylinder is directly driven by a special brushless DC motor. This method improves reliability and time base stability.

3. **Aluminum Die Cast Chassis**

   A die cast chassis improves overall performance and assures high reliability and longer life.

4. **Easy-to-use Operation Switches**

   These switches make the NV-8600 as easy to operate as any conventional audio cassette recorder.

5. **Automatic Stop**

   When recording or playing back or when in fast forward, the unit will automatically stop if the tape reaches its end.

   When rewinding, the unit will automatically stop at the tape beginning or the memory point.

6. **Tape Counter with Memory**

   The tape counter tells you at what point you are in the tape and can be set to stop tape rewinding at the "999" point.

7. **Pause Control**

   With the Pause Control (NV-A181), the tape can be instantly stopped during recording or playback without unthreading the tape.

8. **Watch One Channel, Record Another**

   Because of its built-in UHF/VHF or UHF tuner, the NV-8600 can record a broadcast on one channel while allowing another channel to be viewed.

9. **Unattended Recording**

   With its built-in timer, the NV-8600 can be set to automatically start recording at any time.

10. **Playback through any Conventional TV**

    The built-in RF converter modulates the video signal so that it may be viewed on any conventional TV receiver.

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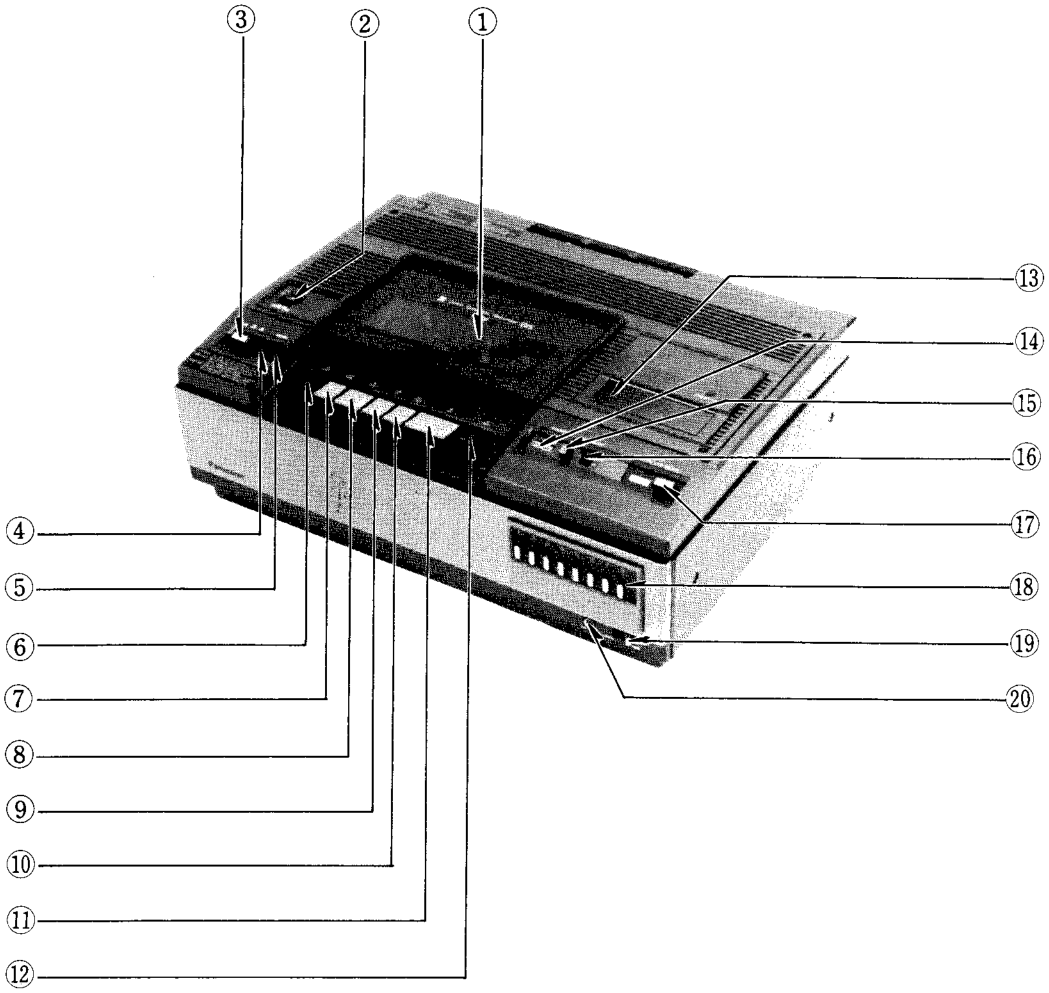
OPERATING COMPONENTS AND THEIR FUNCTIONS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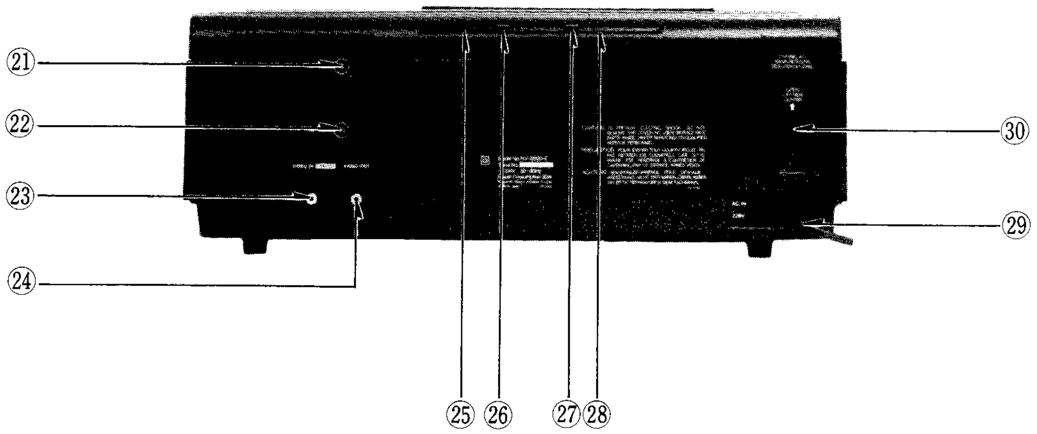
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TOP and FRONT VIEW

① **Cassette Compartment**
For insertion of the video cassette.

② **Tracking Control (TRACKING)**
This control is used to shift the playback scanning of the tape. Normally, it is left in the "FIX" position. It should only be adjusted if, upon playback, the picture appears very noisy or streaked.

③ **VTR Switch (VTR)**
This is a latch type switch used to turn the recorder on and off. Press once and the recorder comes ON. Press again and the recorder is turned OFF.

④ **Power Indicator**
This lamp illuminates when power to the recorder is turned on.

⑤ **Moisture Lamp (MOIST)**
This lamp illuminates if condensation (moisture) is present inside the recorder.
When this lamp is on, the recorder will not operate until it has dried sufficiently.

⑥ **Eject Button (EJECT)**
Press this button to raise the cassette compartment to either insert or remove a cassette. It is not possible to eject any cassette while the tape is moving (Playback, Record, Fast Forward, Rewind), so always be sure the tape is stopped first.

⑦ **Rewind Button (REW)**
Press this button to rewind the tape.
When in rewind, the tape will stop automatically when fully rewound, or at the counter memory position, if the Memory Switch ⑯ is set to "ON".

⑧ **Stop Button (STOP)**
Press this button to stop the Recording, Playback, Rewind or Fast Forward mode.

⑨ **Fast Forward Button (FF)**
Press this button to quickly move the tape in the forward direction. The tape will stop automatically when fully forwarded.

⑩ **Play Button (PLAY)**
Press this button to play back a recorded tape. The tape must be stopped first.

⑪ **Record Button (RECORD)**
Press this button to start recording both picture and sound.

⑫ **Pause Button (PAUSE)**
Press this button to instantly stop the tape movement in either the record or playback modes without unloading the tape.
There is no picture produced when pause in use. Press again to release pause.

⑬ **Digital Timer**
This built-in timer constantly displays the time of day and is used for unattended recording.

⑭ **Tape Counter (COUNTER)**
This is a digital counter which gives a reference as to how far the tape has moved.

⑮ **Tape Counter Reset Button**
Press this button to reset the Tape Counter ⑭ to "000".

⑯ **Memory Switch (MEMORY)**
This switch is used if it is desired to quickly find a specific portion of a recorded tape.

⑰ **TV/VTR Selector (TV/VTR SELECT)**
This switch selects one of two signals which will come out of the RF Output Connector ㉑ or Video Output Jack ㉔ on the rear panel of the recorder.
1) The output from the recorder.
2) The signal from the antenna or cable.
When placed in the "VTR" position, the VHF output of the recorder is sent to the television. The TV tuner must be selected to the same channel for RF Output. Also the video output of the recorder is delivered to the Video Output Jack ㉔. When placed in the "TV" position, the antenna or cable signal is sent to the television. Now use the TV tuner as you normally would.

⑱ **Channel Selectors/Tuning Knobs**
Push any one of these buttons and the channel selected with the corresponding tuning knob will be received. No further tuning is necessary.

- **Tuning Knobs**
Turn to tune to the station you want to receive, while tuning watch the TV screen. The tuning is optimum when the picture is most clear.
Any knob can be used to tune to any station, and, once tuned, these knobs can be left as they are.

⑲ **Input Signal Selector**
This switch is used to select between 2 incoming signals from which recordings can be made.
1) In the "TUNER" position, the signal from the builtin tuners will be recorded.
2) In the "CAMERA" position, the signal which is connected to the Video Input Jack ㉓ and Audio Input Jack ㉖ on the rear panel will be recorded.

⑳ **Microphone Input Jack (MIC)**
This is for the connection of a microphone to record sound onto the tape.

REAR VIEW

㉑ **RF Output Connector (RF OUT)**
This connects to the antenna terminal (DIN type) of a conventional TV receiver. The cable prepared as a standard accessory is used for the connection between the recorder and the TV set.

㉒ **RF Input Connector (RF IN)**
This is where the external antenna is connected to the recorder. The connector is a type "DIN".

㉓ **Video Input Jack (VIDEO IN)**
For connection of a video camera or other input video signal to be recorded.

㉔ **Video Output Jack (VIDEO OUT)**
For direct connection to a video monitor or another video recorder if desired. Not used with a conventional TV receiver.

㉕ **Camera Remote Control Jack (CAMERA REMOTE)**
This connector accepts a signal from the optional WV-460/E video camera which is operated away from the recorder and allows the recorder to pause, thus instantly stopping the reocrding if it is so desired. This is not effective during playback.

㉖ **Audio Input Jack (AUDIO IN)**
This connector accepts the audio signal from the optional video camera to enable the recorder to record the audio portion. This connector can also be used to record the audio from a Hi-Fi amplifier or another type video or audio recorder.

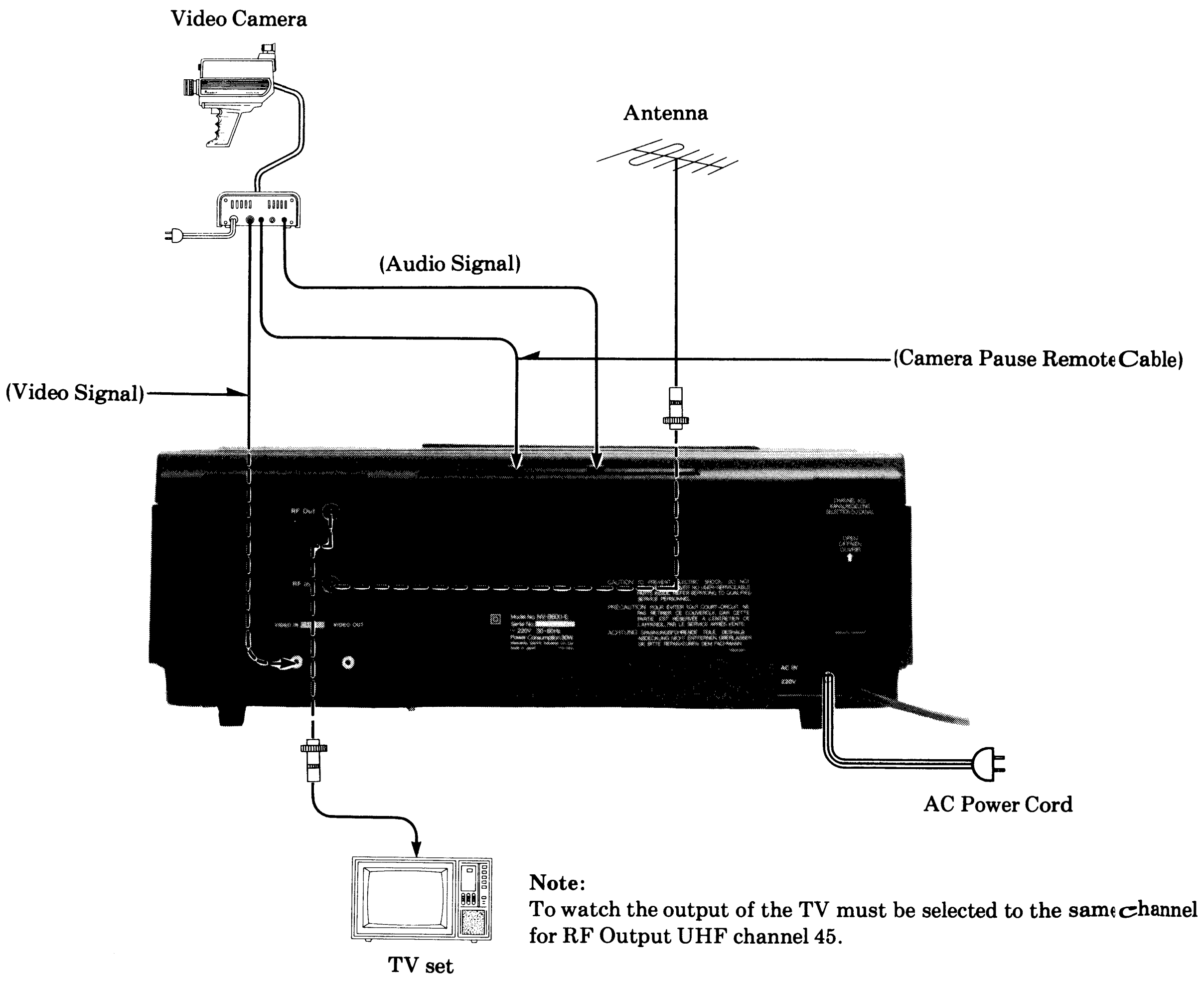
㉗ **Audio Output Jack (AUDIO OUT)**
The audio signal from either the recording source, or the playback audio is present at this connector. This signal can be connected to a video monitor or Hi-Fi amplifier or to another type video recorder if desired.

㉘ **Remote Control Jack (REMOTE)**
By connecting the remote control switch here, the recorder may be paused by remote control (standard accessory) in both the Recording and Playback modes.

㉙ **AC Power Cord**

㉚ **RF Converter Slot**

CONNECTIONS



Note:
To watch the output of the TV must be selected to the same channel for RF Output UHF channel 45.

VHS-PRINCIPLE OF OPERATION

Basic Video Tape Recording

To understand the VHS format, it is wise to first review the basic principles of video tape recording.

Like audio tape recording, video information is stored on magnetic tape by means of a small electromagnet, or head. The two poles of the head are brought very close together but they do not touch. This creates magnetic flux to extend across the separation (gap), as shown: Fig. 1.

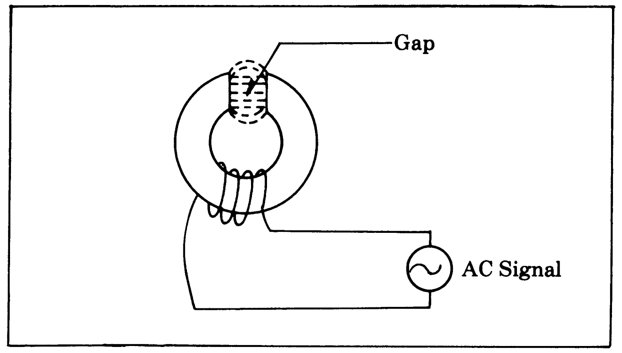


Fig. 1

If an AC signal is applied to the coil of the head, the field of flux will expand and collapse according to the rise and fall of the AC signal.

When the AC signal reverses polarity, the field of flux will be oriented in the opposite direction and will also expand and collapse. This changing field of flux is what accomplishes the magnetic recording. If this flux is brought near a magnetic material, it will become magnetized according to the intensity and orientation of the field of flux. The magnetic material used is oxide coated (magnetic) tape. Using audio tape recording as an example, if the tape is not moved across the head, just one spot on the tape will be magnetized and will be continually re-magnetized. If the tape is moved across the tape, specific areas of the tape will be magnetized according to the field of flux at any specific moment. A length of recorded tape will therefore have on it areas of magnetization representing the direction and intensity of the field of flux. For instance:

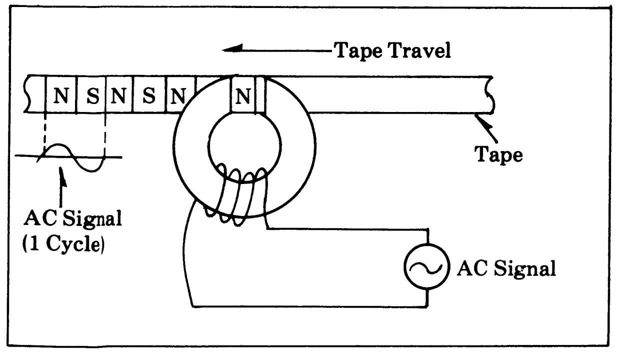


Fig. 2

The tape will have differently magnetized regions, which can be called North (N) and South (S), according to the AC signai. When the polarity of the AC signal changes, so does the direction of magnetization on the tape, as shown by one cycle on the AC signal (see Fig. 2). If the recorded tape is then moved past a head whose coil is connected to an amplifier, the regions of magnetization on the tape will set up flux across the head gap which will in turn induce a voltage in the coil to be amplified. The output of the amplifier, then is the same as the original AC signal. This is essentially what is done in audio recording, with other methods for improvement like bias and equalization.

There are some inherent limitations in the tape recording process which do effect video tape recording, so they will be examined now. As shown in Fig. 3, the tape has North and South magnetic fields which change according to the polarity of the AC signal. What if the frequency of the AC signal were to greatly increase?

If the speed of the tape past the head (head to tape speed) is kept the same, the changing polarity of the high frequency AC signal would not be faithfully recorded on the tape, as shown:

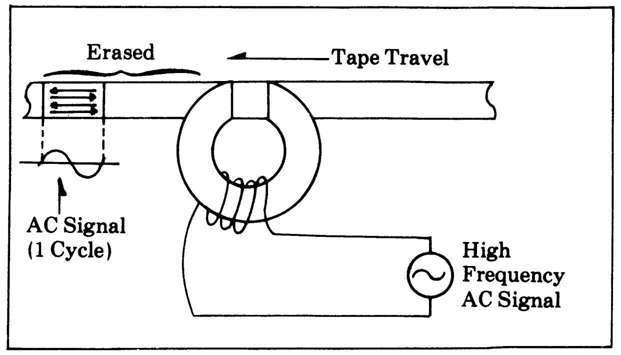


Fig. 3

As the high frequency AC signal starts to go positive, the tape will start to be magnetized in one direction. But the AC signal will very quickly change its polarity, and this will be recorded on much of THE SAME PORTION of the tape, so North magnetic regions will be covered by South magnetic regions and vice versa. This results in zero signal on the tape, or self-erasing. To keep the North and South regions separate, the head to tape speed must be increased. (See Fig. 3.)

When recording video, frequencies in excess of 5MHz may be encountered. Through experience, it is found that the head to tape speed must be in the region of 10 meters per second in order to record video signals.

The figure of 10 meters per second was also influenced by the size of the head gap. Clearly, the lower the head to tape speed, the easier it is to control that speed. If changes in head gap size were not made, the necessary head to tape speed would have been considerably higher. How the gap size influences this can be explained by Fig. 4.

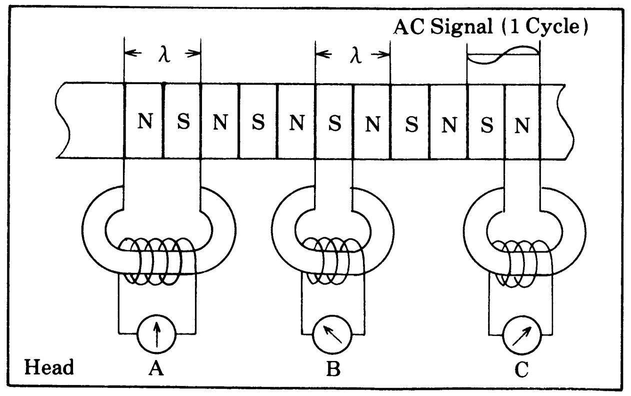


Fig. 4

Assume a signal is already recorded on the tape. The distance on the tape required to record one full AC signal cycle is called the RECORDED WAVELENGTH or λ. Head A has a gap width equal to λ. Here, there is both North and South oriented magnetization across the gap.

This produces a net output of zero since North and South cancel. Heads B and C have a maximum output because there is just one magnetic orientation across their gaps.

Maximum output occurs in heads B and C thereforce, because their gap width is 1/2 λ. (Heads B and C would also work if their gap width is less than 1/2 λ.) The same is also true for recording. The maximum useable (no self-erasing) transfer of magnetic energy to the tape occurs when the gap width, G, can be expressed as.

$$G \leq \frac{\lambda}{2}$$

The RECORDED WAVELENGTH, can be expressed as:

$\lambda = \frac{V}{f}$ where V is the head to tape speed and f is the frequencies to be recorded.

So, $G \leq \frac{V}{2f}$, as V increases, G is also allowed to increase for the same MAXIMUM frequency. Conversely if G is made very small, V is allowed to be reduced.

In practice, G can be made as small as (and smaller than) 1μm (1×10^{-6} meters) and this puts V in the area of 10 meters per second.

A head to tape speed of 10 meters per second is a very high speed, too high in fact to be handled accurately by a reel to reel tape machine of reasonable size. Also, tape consumption on a high speed reel to reel machine is tremendous.

The method employed in video recording is to move the video heads as well as the tape. If the heads are made to move fast, across the tape, the linear tape speed can be kept very low.

In 2-head helical video recording (the only format which will be discussed here) the video heads are mounted in a rotating drum or cylinder, and the tape is wrapped around the cylinder. This way, the heads can scan the tape as it moves. When a head scans the tape, it is said to have made a TRACK. This can be seen in Fig. 5.

In 2-head helical format, each head, as it scans across the tape will record one TV field, or 312.5 horizontal lines. Therefore, each head must scan the tape 25 times per second to give a field rate of 50 fields per second.

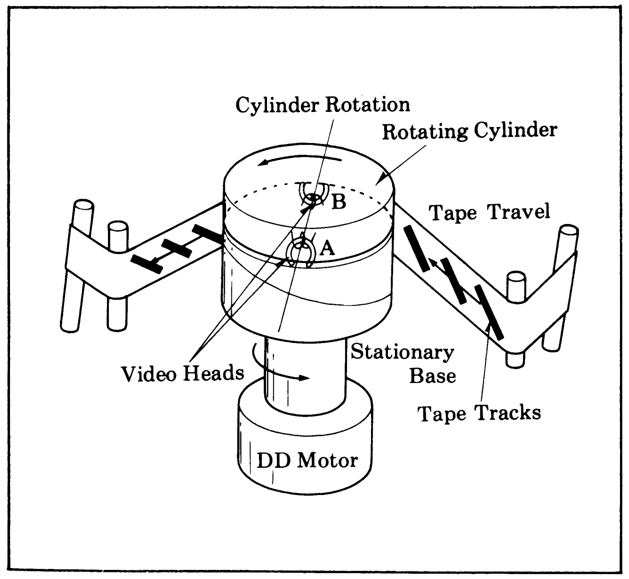


Fig. 5

The tape is shown as a screen wrapped around the head cylinder to make it easy to see the video head. There is a second video head 180° from the head shown in front. Because the tape wraps around the cylinder in the shap of a helix (helical) the video tracks are made as a series of slanted lines. Of course, the tracks are invisible, but it is easier to visualize them as lines. The two heads "A" and "B" make alternate scans of the tape.

An enlarged view of the video tracks on the tape can be shown in Fig. 6.

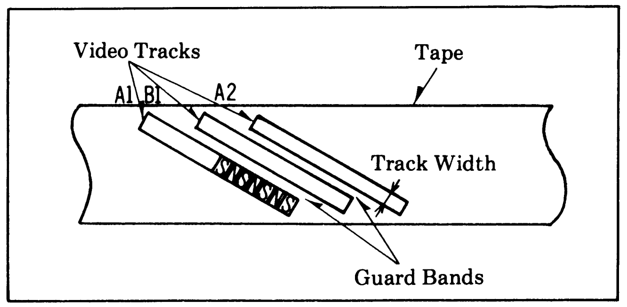


Fig. 6

Refer to Fig. 6. The video tracks are the areas of the tape where video recording actually takes place. The guard bands are blank areas between tracks, preventing the adjacent track's crosstalk from appearing on the track where the video head is tracing.

There is one more point about video recording which will be discussed here. Magnetic heads have the characteristic of increased output level as the frequency increases. Then, as determined by the gap width, the maximum output occurs at approximately $G = \frac{V}{2f}$.

In practice, the lower frequency output of the heads is boosted in level to equal the level of the higher frequencies. This process, as also used in audio applications, is called equalization.

Video frequencies span from DC to about 5MHz. This represents a frequency range of about 18 octaves. 18 octaves is too far a spread to be handled in one system (one machine). For instance, heads designed for operation at a maximum frequency of 5MHz will have very low output a low frequencies. Since there is 6dB/octave attenuation, 18×108dB difference appears. In practice this difference is too great to be adequately equalized. To get around this, the video signal is applied to an FM modulator during recording. This modulator will change its frequency according to the instantaneous level of the video signal.

The energy of the FM signal lies chiefly in the area from about 1MHz to 10MHz, just three octaves. Heads designed for use at 10MHz can still be used at 1MHz, because the output signal can be qualized. Actually speaking, heads are designed for use upto about 5MHz. Therefore, some FM energy is lacked but it does not affect the playback video signal much, because information incleded in high frequency region does not affect so much.

Upon playback, the recovered FM signal must be equalized then demodulated to obtain the video signal.

CONVERTED SUBCARRIER DIRECT RECORDING METHOD

The one method of colour video recording that will be discussed here is the converted subcarrier method. In order to avoid visible beats in the picture caused by the interaction of the colour (chrominance) and brightness (luminance) signals, the first step in the converted subcarrier method is to separate the chrominance and luminance portion of the video signal to be recorded. The luminance signal, containing frequencies from DC to about 5MHz, is then FM recorded, as previously described. The chrominance portion, containing frequencies in the area of 4.43MHz is down-converted in frequency in the area of 627kHz. Since there is not a large shift from the center frequency of 627kHz, this converted chrominance signal is able to be recorded directly on the tape. Also note that the frequencies in the area of 627kHz are still high enough to allow equalized playback. In practice, the CONVERTED CHROMINANCE signal and the FM signals are mixed and then simultaneously applied to the tape. Upon playback, the FM and converted chrominance signals are separated. The FM is demodulated into a luminance signal again. The converted chrominance signal is reconverted back up in frequency area of 4.43MHz. The chrominance and luminance signals are combined which reproduces the original video signal.

VHS Format

1. HIGH DENSITY RECORDING SYSTEM

A. Elimination of the guard band

In VHS format, it is possible to record or playback up to 3 hours of material. And in addition, the size of the reel of tape (although inside the cassette) is reduced, not increased as might be expected. This increase in recording time and reduction in tape reel size represents an increase in recording density; the tape is more densely filled with information.

To achieve greater recording density, the guard bands between the video tracks on the tape have been reduced to zero. This way, there is no wasted space.

Because the video tracks actually meet, there is danger of interference in playback because the video head, when scanning a particular video track, will also receive some signal from the adjacent track. See Fig. 6.

CCIR STANDARD I TYPE
Tape Speed 16.3cm/sec

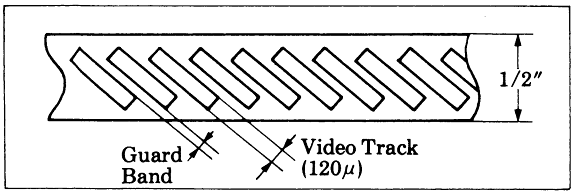


Fig. 7

STANDARD CASSETTE U-TYPE
Tape Speed 9.5cm/sec

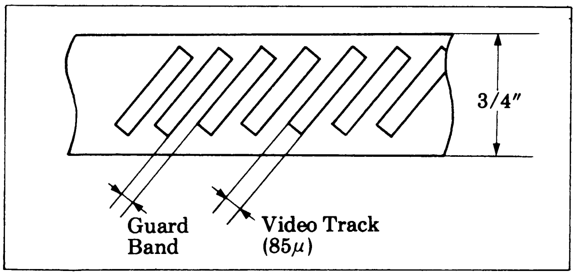


Fig. 8

PAL VHS STANDARD
Tape Speed 2.339cm/sec

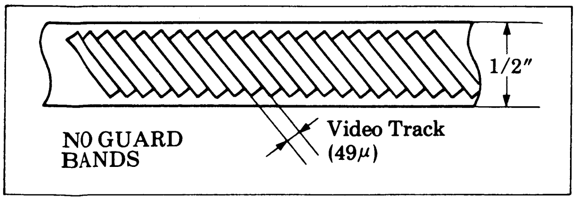


Fig. 9

As can be seen by the comparison of different tape formats with VHS format, the elimination of the guard bands greatly increases recording density. But again, the lack of guard band also presents a problem. In playback, when a video head scans a particular track, it will inadvertently pick up some information from an adjacent track. This would cause objectionable interference. To overcome this, Azimuth Recording is employed. This technique is covered later.

B. Reduction of Track Width

The elimination of the guard band is a significant help in increasing the recording density. Of equal significance is the reduction of the video track width. Since the track themselves consume less tape space, more information can be stored because more tracks will fit onto a particular length of tape.

Refer to Fig. 7, 8, 9:

A typical video track width in other helical applications is in the area of 100μm (microns, 1×10^{-6} meters). In VHS, the track width is 49μm. This means that the actual size of the video head must be reduced, because the head size determines the track width.

C. Reduction of Tape Speed

In order to move the smaller video tracks close enough together so that adjacent tracks meet, the tape speed must be reduced. The reduction of tape speed will mean that less tape moves past the video head cylinder per unit time, so therefore, the unchanged speed of the rotating video heads will place the video tracks closer together. Linear tape speed in VHS is 2.339cm/sec.

2. NEW VIDEO HEADS

A. The Need for New Video Heads

We have already discussed the reduced track width. This reduction requires the use of a smaller video head. Just making them smaller does not make them better. With less of actual head material to work with, the magnetic properties of the head suffers. To offset this a change in the head material is in order. Because the VHS recorder is designed to be small, a reduction in the size of the head cylinder was called for.

A reduction in the size (diameter) of the head cylinder changes the head to tape speed Remember, the head to tape speed the high frequency recording capability of the head. To offset this problem, the head gap size was reduced.

As mentioned before, Azimuth Recording is utilized in VHS. The heart of the Azimuth Recording process is in the video heads themselves. This requires still another change in head design.

B. Hot Pressed Ferrite

The use of Hot Pressed Ferrite as video head material in VHS helps to improve the characteristics of the smaller head. The Hot Pressed Ferrite also has uniform domain orientation which further improves the head characteristics. It has been proven in many tests that the use of Hot Pressed Ferrite produces a superior video head.

C. Head Gap

1. Width

As explained, the need for smaller head gap size became apparent. In VHS, the video heads have gap widths of a mere 0.3μm (0.3×10^{-6} meters).

This is quite a contrast with ordinary video heads used in other helical applications whose gap widths are typically in the area of 1μm.

2. Azimuth

Azimuth is the term used to define the left to right tilt of the gap if the head could be viewed straight on.

In previous VTR applications the azimuth was always set to be perpendicular to the direction of the head travel across the tape, or more simply, the video track. Fig. 11 helps explain this.

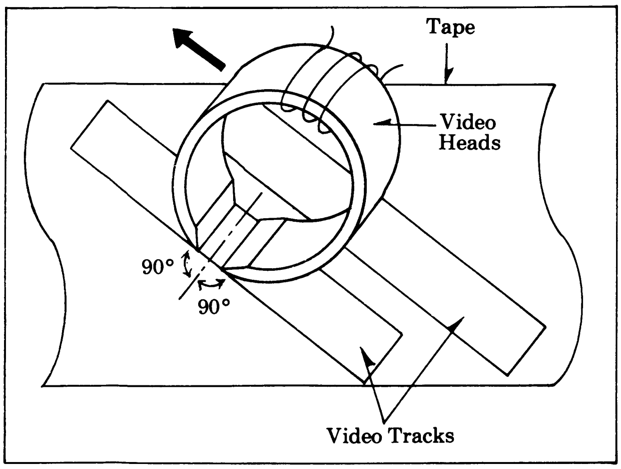

Tape
Video Heads
90°
90°
Video Tracks

Fig. 10

Fig. 10 shows that the gap is perpendicular to (90°) the head's movement. We can think of this standard as a perfect azimuth of 0°.

In VHS, the video heads have a gap azimuth other than 0°. And more, one video has a different azimuth from the other. The 2 values used in VHS are azimuth of +6° and −6°. Refer to Fig. 11.

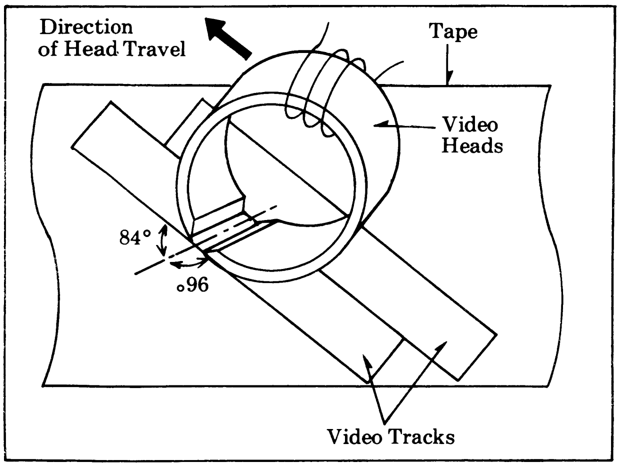

Direction of Head Travel
Tape
Video Heads
84°
96°
Video Tracks

Fig. 11

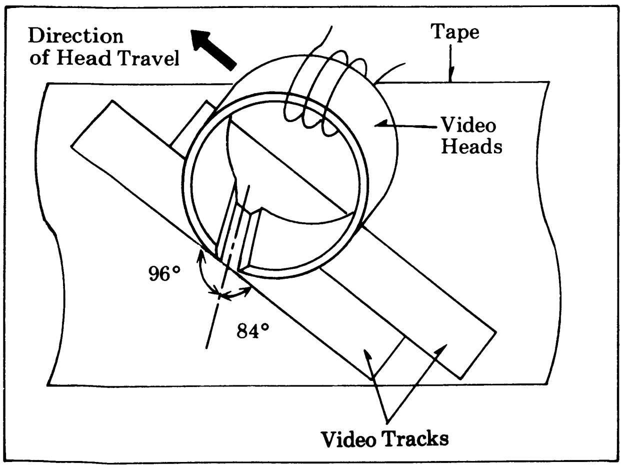

Direction of Head Travel
Tape
Video Heads
96°
84°
Video Tracks

Fig. 12

These heads make the VHS format different from most other VTR formats. Exactly how the azimuth's of ±6° helps to keep out adjacent track interference is explained next.

3. AZIMUTH RECORDING

Azimuth Recording is used in VHS to eliminate the interference or crosstalk picked up by a video head. Again, because adjacent video tracks touch, or crosstalk, a video head when scanning a track will pick up some information from the adjacent track. The azimuths of the head gaps assure that video head "A" will only give an output when scanning across a track made by head "A". Head "B", therefore, only gives an output when scanning across a track made by head "B". Because of the azimuth effect, a particular video head will not pick up any crosstalk from an adjacent track. Let's examine this more closely.

In Fig. 13, we can see the video tracks with not to scale North and South magnetized regions in them.

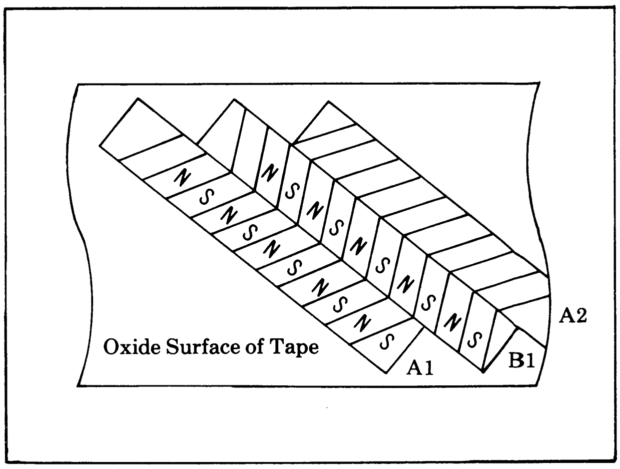

N
S
Oxide Surface of Tape
A1
B1
A2

Fig. 13

It can also be seen that these N or S regions are not perpendicular to the track, they have −6° azimuth in tracks A1, A2; and +6° azimuth in tracks B1, B2.

If we take track A1 and darken the N regions, it becomes easier to see.

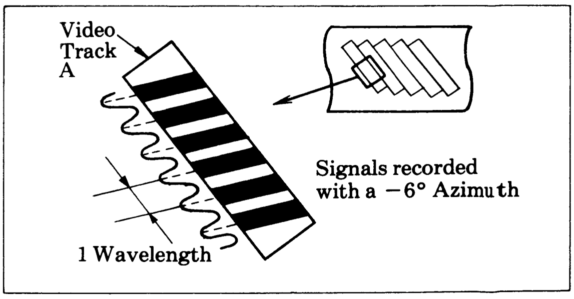

Video Track A
Signals recorded with a −6° Azimuth
1 Wavelength

Fig. 14

If Fig. 14, we see the information on track B, made by head "B". Imagine now that head "B" is going to playback this track, by superimposing the head over the track. Clearly, the gap fits exactly over the N and S regions, so that at any moment there is either an N region or an S region or an N to S (or S to N) transition across the gap. This produces maximum output in head "B". Now, visually superimpose the "A" head over the track.

Here there are N and S regions across the gap at the same time, at any given moment. Remember that simultaneous N and S regions across the gap cause cancellation, and therefore no output. Looking at Fig. 15, we can see that the gap width is equal to 1/2 the recorded wavelength. Recall that this occurs at the highest frequency which is to be recorded.

So therefore, the azimuth effect works at these high frequencies.

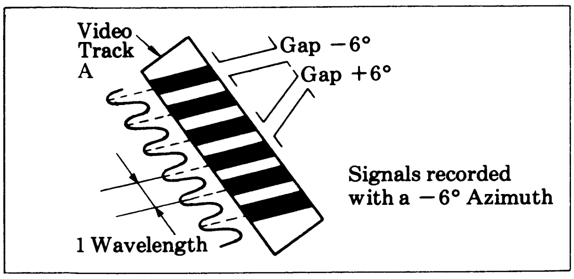


Fig. 15

But what happens at lower frequencies? In Fig. 16, we see a diagram similar to Fig. 15, except the the recorded wavelength is longer, which represents a lower frequency.

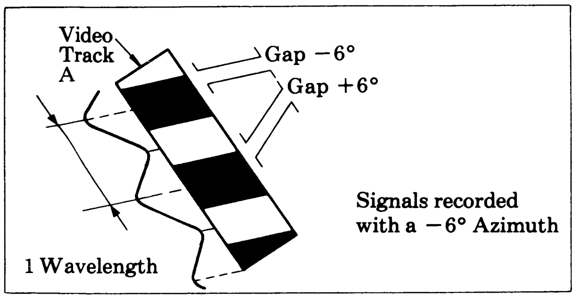


Fig. 16

Again, visually superimpose the heads over the track. Head "B" is the same as before. But look at head "A". There is much less cancellation across the gap, and its output is close to that of head "B". Therefore, we see where the azimuth effect is dependent on frequency. The higher the frequency, the better the azimuth effect. The lower the frequency, the lower the separation by azimuth effect.

The azimuth effect, then, can be used for the high fresquency FM or luminance portion of the signal to be recorded, but in the frequency region of the converted subcarrier, a new method is used to eliminate adjacent channel crosstalk.

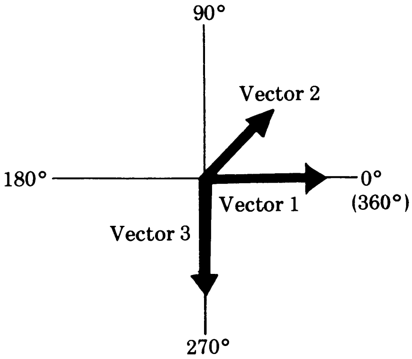
4. VHS COLOUR RECORDING SYSTEM

Because there is insignificant azimuth affect at lower frequencies, a new colour recording system must be adopted.

The fact that crosstalk occurs at lower frequencies cannot be changed, this happens right at the tape during playback. The method adopted processes the crosstalk component signals from the heads so that they are eliminated. It is important to realize that the crosstalk DOES STILL OCCUR. It is the recording/playback circuitry that performs the elimination.

In ordinary Helical VTR's using converted subcarrier direct recording, the phase of the chrominance signal is untouched, recorded directly onto the tape. The chrominance signal and its phase can be represented by vectors. Vectors graphically represent the amplitude and phase of ONE frequency. In this descussion, we will consider (for simplicity) the chrominance signal to be of one frequency. As an example of vectors, see Fig. 17.

The length any vector represents its amplitude.



Vector 1 has a phase angle of 0°
Vector 2 has a phase angle of 45°
Vector 3 has a phase angle of 270°

Fig. 17

We know that the azimuth effect will not work at the lower frequencies. And since the colour information in VHS is recorded at low-converted frequencies, a new method of colour recording was adopted.

Vector Rotation in Recording is actually a phase shift process that occurs at a horizontal rate, 15,625 Hz.

The chrominance signal can be represented by a vector, showing amplitude and phase. (↑)

In ordinary Helical Scan VTRs' the vector is of the same phase for every horizontal line, on every track:

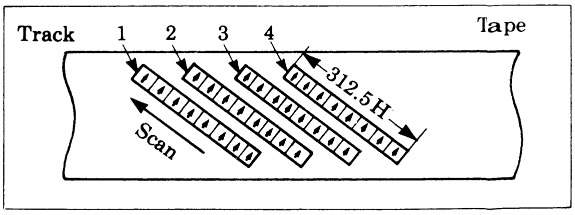


Fig. 18

In VHS, we still convert the 4.43 MHz down to a lower frequency, namely 627 kHz, but the new colour method used in VHS format is a process of vector rotation. During recording, for head "A" (CHANNEL 1), the CHROMINANCE phase of horizontal line in the same phase.

For head "B" (CHANNEL 2) we DELAY the chrominance phase 90° per horizontal line (H).

VECTOR (PHASE) ROTATION:

CHANNEL 1 Same phase/H
CHANNEL 2 −90°/H

Fig. 19 shows what this looks like on tape.

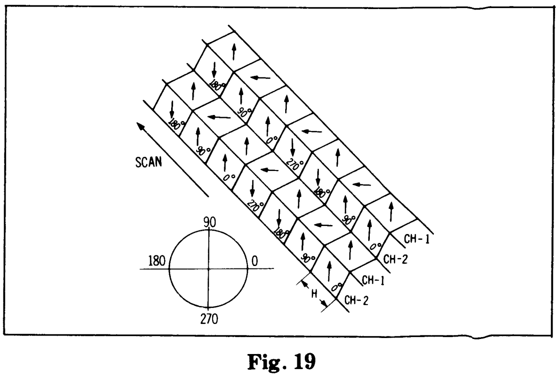


Fig. 19

Now assume that head "A" or "B" plays back over track A1 or B1 it will produce a vector output as such:

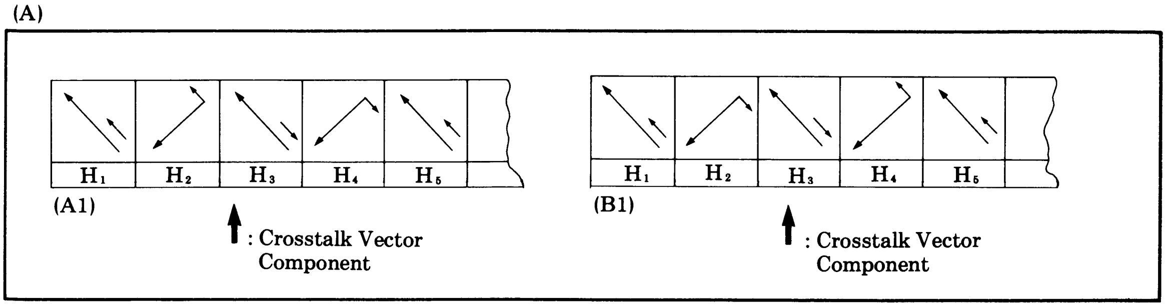


Fig. 20

Head "A" or "B" when tracking over A1 or B1 will have an output consisting of the main signal (large vectors) and some crosstalk components (small vectors).

Fig. 21, then is a vector representation of the playback chrominance signal from the head.

One of the most important things done in the playback process is the restoration of the vectors to their original phase. This is done by reversing the vector rotation process that was used in the recording.

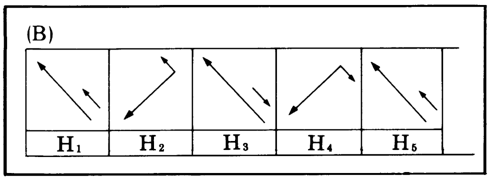


Fig. 21

This restored signal is then split 2 ways. One path goes to one input of an adder. The other path goes to a delay line which delays the signal by 2H. The output of the delay line goes to the other input of the adder. Fig. 22 explains.

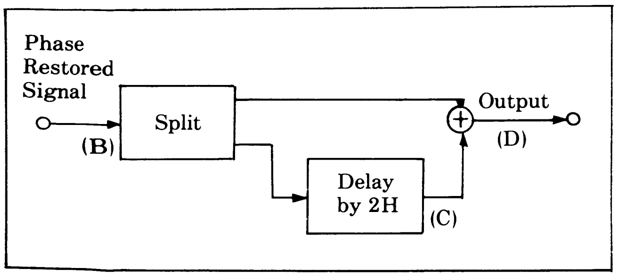


Fig. 22

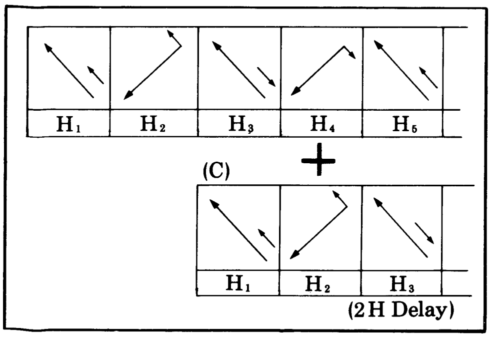


Fig. 23

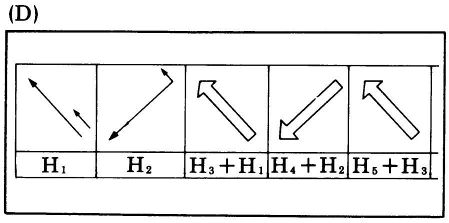


Fig. 24

As can be seen in Fig. 23, the crosstalk component has been eliminated after the first H line. We have now a chrominance signal free of adjacent channel crosstalk.

The double output in Fig. 24 is not a problem because it can always be reduced. The process of adding a delayed line to an undelayed line is permissable because any 2 adjacent lines in a field contain nearly the same chrominance information.

So, if 2 adjacent lines are added, the net result will produce no distortion in the playback picture.

In conjunction with the crosstalk elimination is the re-conversion of the chrominance 627kHz to its original 4.43MHz. Now the color signal is totally restored.

5. THE RECORDED SIGNAL

Video signals, as stated before contain frequencies between DC and about 5MHz.

In converted subcarrier direct recording, the luminance and chrominance portions of the signal are separated.

This process of separation reduces somewhat the frequency range of the luminance and chrominance signals. Since the VHS colour system is a form of converted subcarrier direct recording, it too encounters this effect. The frequency ranges of the separated luminance and chrominance signals can be shown. See Fig. 25.

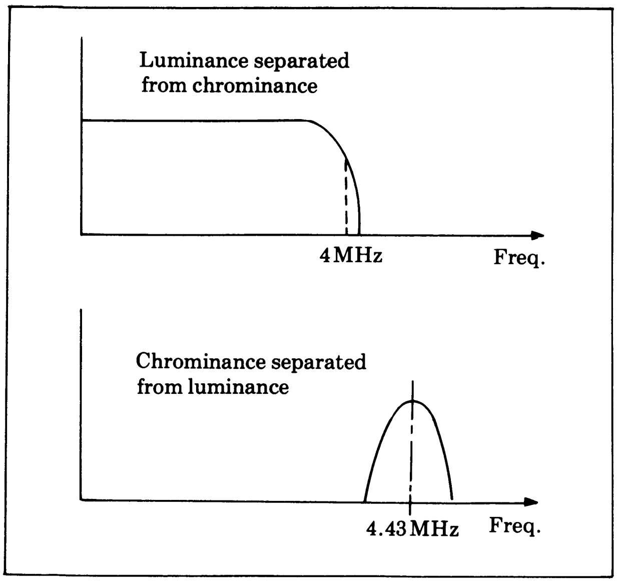


Fig. 25

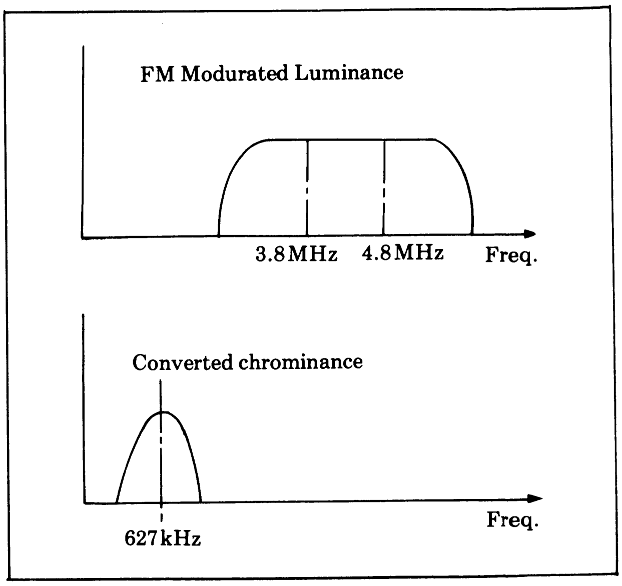


Fig. 26

When the luminance signal is FM modulated, it produces an FM signal which occupies a new area in the spectrum.
It was explained before that the instantaneous level of the video signal sets the instantaneous frequency of the FM carrier.
In VHS the lowest level of the video signal, sync tip, sets the FM carrier to 3.8MHz. Peak white portions of the video signal set the FM carrier to 4.8MHz. Carrier deviation is therefore from 3.8 to 4.8MHz. When generating an FM signal, sidebands are also produced. These sidebands lie above the 4.8MHz carrier swing and below the 3.8MHz carrier swing. See Fig. 26.
When the chrominance signal is converted down to 627kHz it will lie below the lower sidebands of the FM modulated luminance signal. Also see Fig. 26.

6. TAPE LOADING

In VHS, the tape path out of the cassette, across the stationary heads and around the video head cylinder forms a letter "M", thus the name "M" Loading. See Fig. 28.

The M loading has several advantages over previous, more complex loading formats.

The FM and converted chrominance signals are mixed before being recorded. The actual signal that is applied to the tape is shown in Fig. 27.

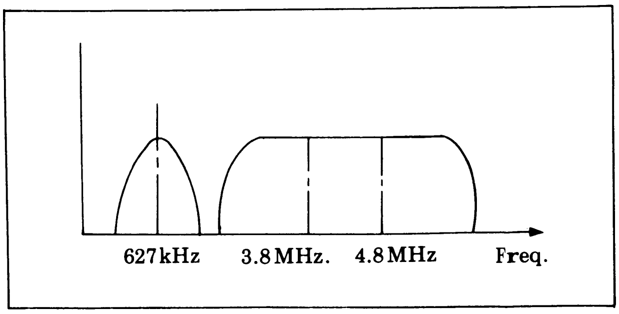


Fig. 27

1) Less tape is pulled out from the cassette. This reduces the chances of tape spillage and tangles.
2) Because the tape path in the M load pattern is short, loading time is only 3 seconds, including video muting.
3) FF and REW are performed INSIDE the cassette, further reducing the chances of tape damage.

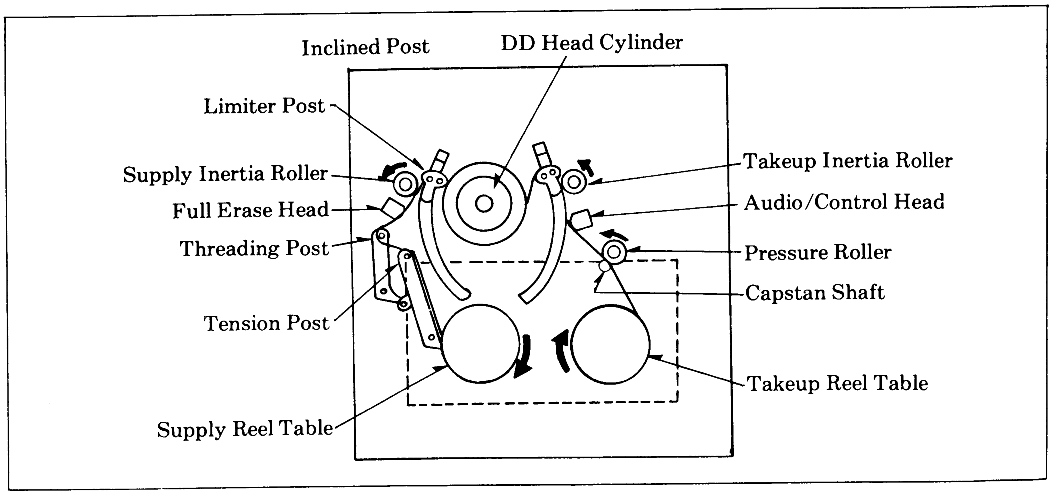

Inclined Post
DD Head Cylinder
Limiter Post
Supply Inertia Roller
Full Erase Head
Threading Post
Tension Post
Supply Reel Table
Takeup Inertia Roller
Audio/Control Head
Pressure Roller
Capstan Shaft
Takeup Reel Table

Fig. 28

7. SAFETY FEATURES

The M loading format incorporates many safety features to guard against accidental damage to the tape. If any of the mechanical failures listed below occurs, the recorder will go into the stop mode.

1) If loading takes longer than 5 sec.
2) If take up fails to start after 3 sec.
3) If take up fails during Record or Playback.
4) If the head cylinder fails to start.
5) If ANY belt breaks.
6) If the auto-stop lamp burns out.

The video tape in the cassette is worth protecting, so if any of these potentially dangerous failures occurs while the unit is recording or playing back, it will automatically stop.
It cannot be operated again until the problem is solved.

8. THE TAPE AND TAPE FORMAT

The tape used in VHS is by itself a high quality product which assures good performance in a high density system.
The format of the tape for PAL VHS standard is shown, in Fig. 29.

Tape Width (t):	1/2″
Tape Speed:	23.39mm/sec
Head to Tape Speed:	4.85m/sec

Video Track:	
Width (w);	49μ (0.049mm)
Angle (a);	5°57′
Audio Track:	
Width (b);	1mm
Control Track:	
Width (c);	0.75mm

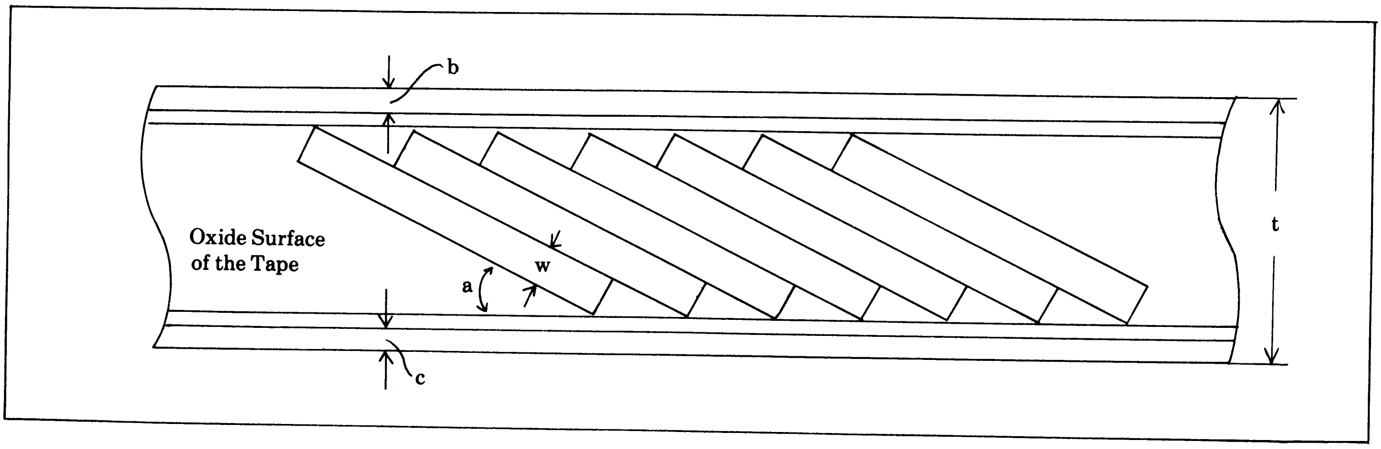


Fig. 29

CIRCUIT DESCRIPTION

Power Supply Circuit

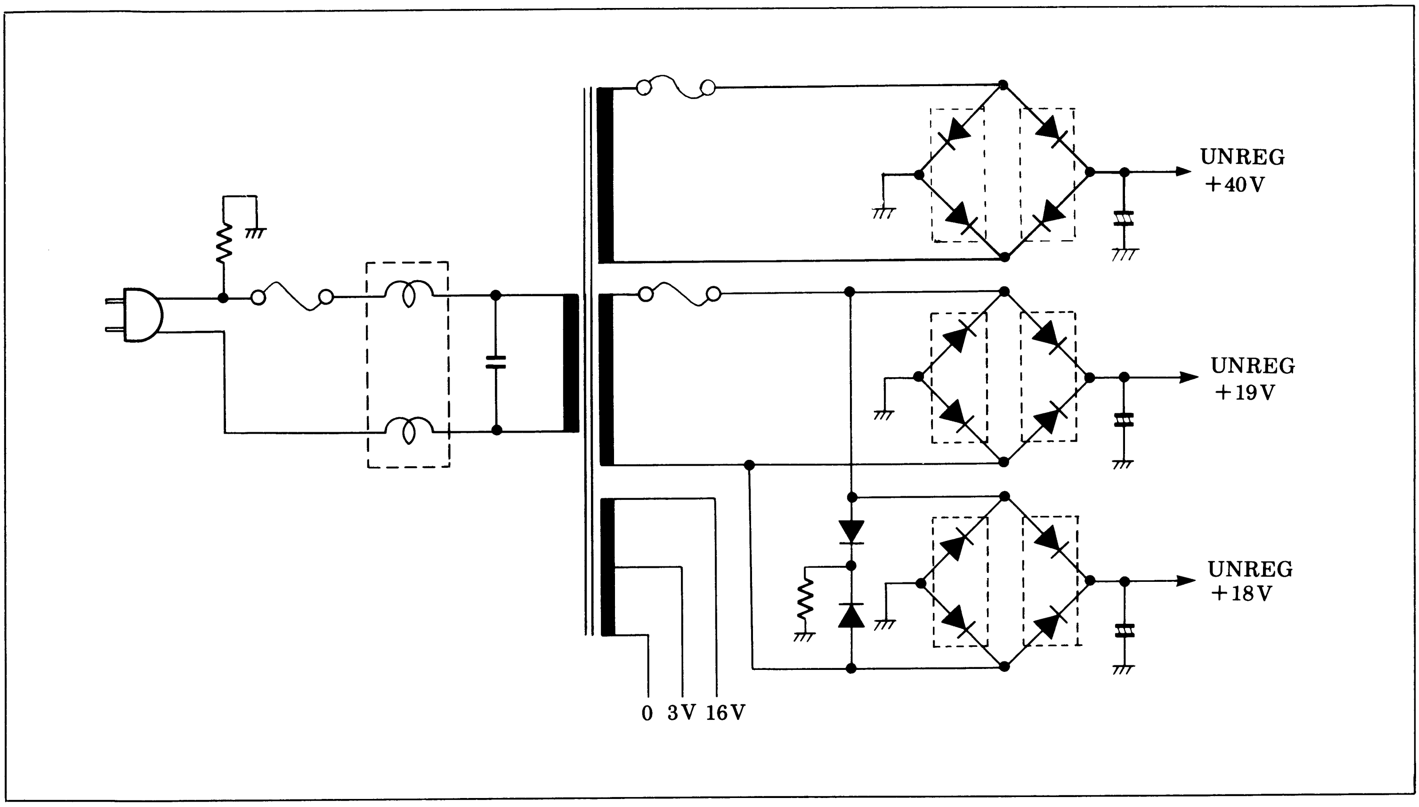


Fig. 30

The NV-8600 Video Cassette Recorder power supply uses a power transformer (T6301) and three bridge rectifier circuits to develop sources of unregulated +18 volts, unregulated +19 volts and unregulated + 40 volts DC. Using D105 and D106, produce the "power off detector" supply. This voltage is applied to the Transport and Control board logic system to sense a power failure and operate the stop solenoid and pressure roller solenoid so that the machine is not left in an operating mode in the event that AC power is lost.
The 16-volts AC and 3-volts AC are used to operate the digital timer.
AC power for the main power transformer is supplied from the AC line through a 1.0A (F101) protects unregulated +19 volts and unregulated +18 volts supply. And the fuse 250mA (F102) protects unregulated +40 volts supply.
The unregulated 19-volts supply is applied to the transport and Servo Board where upon it provides power to operate much of the logic circuitry contained on operate on this board as well as pressure solenoid. Also voltage is supplied to the D-D Motor where it provides input power to operate the three-phase inverter that ultimately drives the D-D cylinder motor.
The unregulated 18 volts supply is applied to Transport Board whereupon it is regulated to 12 volts DC which is operated by a servo regulator circuit that utilizes low-level driver circuit. The 12 volts source appears at the emitter of transistor Q6301 and is measurable at test point TP612.
The unregulated 40 volts supply is applied to the TV demodulator section.
The unregulated 3 volts and 16 volts are applied to Timer Circuit whereupon it provides power to operate much of the logic circuit on this board.

Regulator & Transport Circuits

GENERAL

The transport control board (VEP0669EI), contains all of the circuits used for stop solenoid activation, pressure roller solenoid activation, loading and unloading, head cylinder protection, some circuits for Servo Control and Audio Section.
The explanations will be given section by section, Fig. 31.
We can see the various functions it performs.

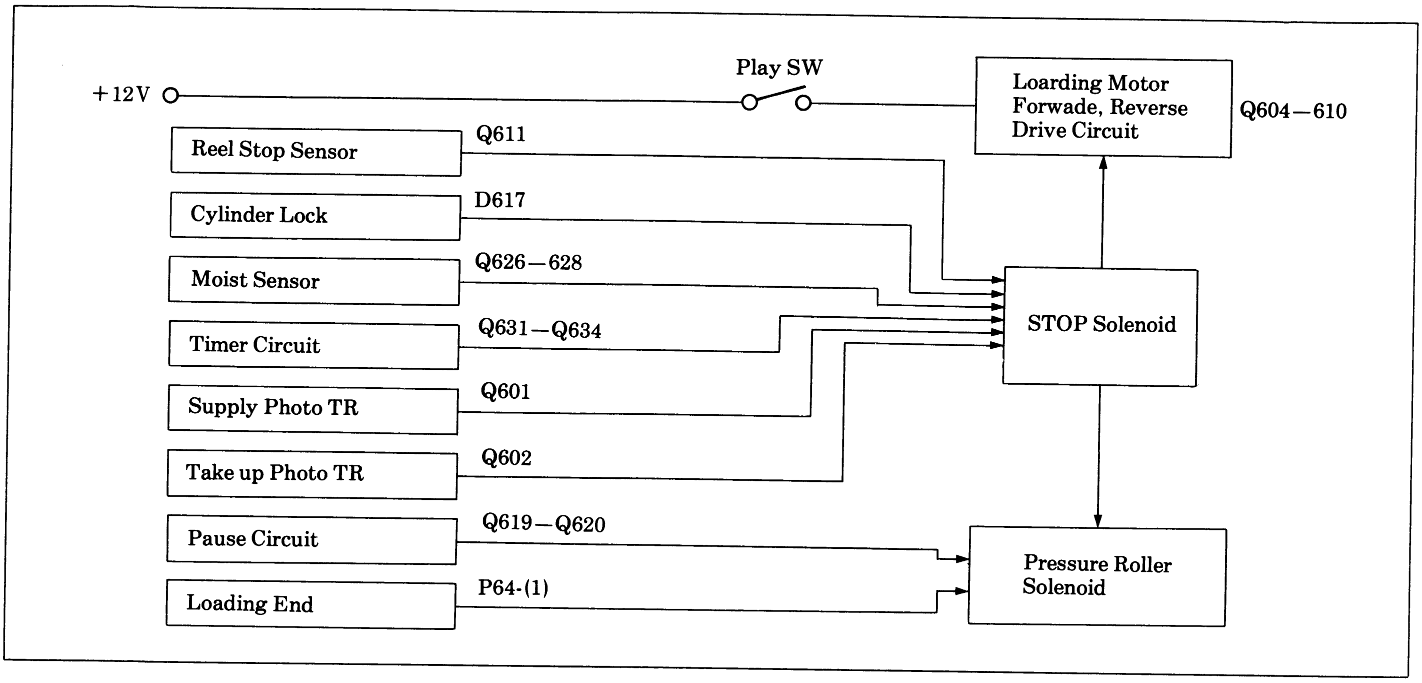

+12V
Play SW
Loarding Motor Forwade, Reverse Drive Circuit
Q604—610
Reel Stop Sensor
Q611
Cylinder Lock
D617
Moist Sensor
Q626—628
Timer Circuit
Q631—Q634
STOP Solenoid
Supply Photo TR
Q601
Take up Photo TR
Q602
Pause Circuit
Q619—Q620
Pressure Roller Solenoid
Loading End
P64-(1)

Fig. 31

I. Stop Solenoid

The stop solenoid, when activated, will mechanically place the operation buttons into the stop mode, just as if someone pressed the STOP button. The stop solenoid functions mainly as a safety device to stop the unit in the event that any of several potentially dangerous conditions occur.
These conditions are detected by:

1. **Take up Sensor**
   If the unit is rewinding, and the beginning of the tape is reached, it is desirable to have the unit stop before undue strain is placed on the tape. The very beginning of the tape is actually a translucent plastic leader. When the sensor lamp shines through this leader into the take-up photo transistor, the unit stops.
2. **Supply Sensor**
   If the unit is in record, playback or fast forward, it is again desirable to stop the unit before the actual end of the tape is reached. The end of the tape is again a translucent leader which when detected by the supply photo transistor will stop the unit.
3. **Sensor Lamp**
   This is the lamp that actually shines light through the translucent tape into either of the photo transistors. If this lamp burns out, the unit will stop so that tape damage cannot occur in the FF or REW modes. (Because in this case, the photo transistors will not operate.)
4. **Tape Protection**
   If the unit somehow fails to load after 5 seconds or if during record or playback, take-up fails for more than 3 seconds, the unit will stop—anticipating a problem.

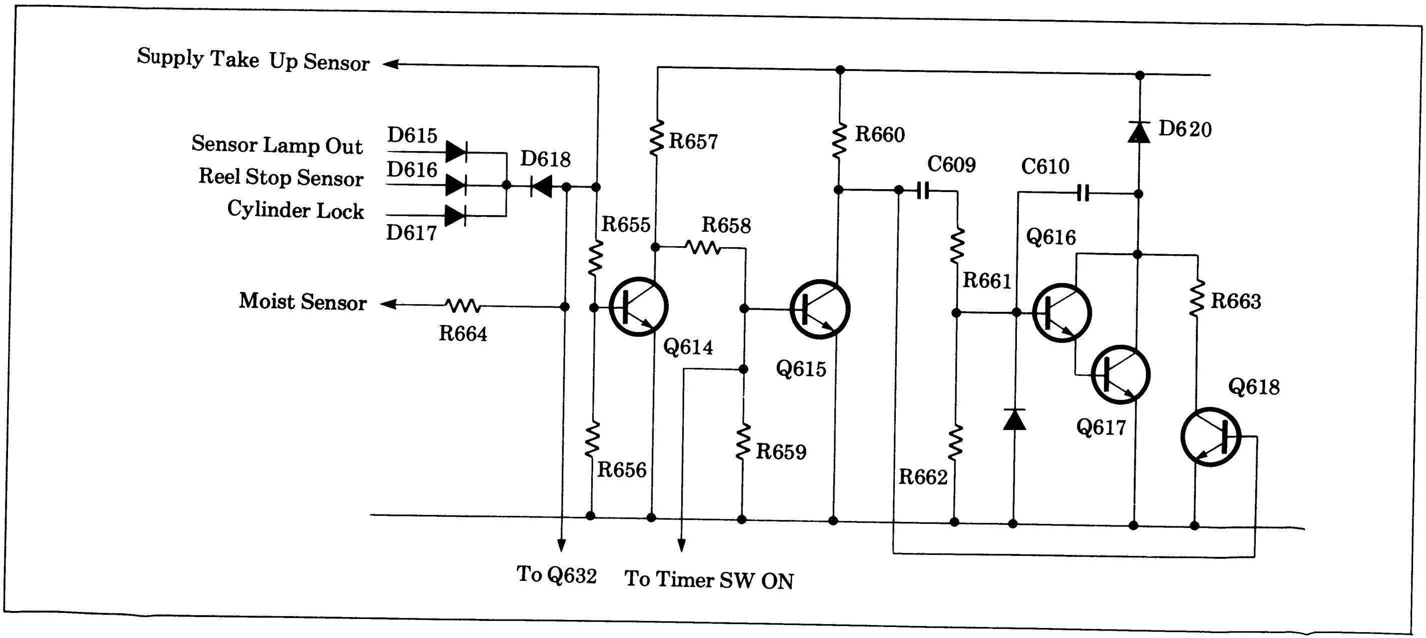

Supply Take Up Sensor
Sensor Lamp Out
Reel Stop Sensor
Cylinder Lock
D615
D616
D617
D618
Moist Sensor
R664
R657
R655
R658
Q614
R656
R659
Q615
R660
C609
C610
D620
R661
R662
Q616
Q617
R663
Q618
To Q632
To Timer SW ON

Fig. 32

5. **Moist Sensor**

   If moisture or condensation occurs inside the unit around the head cylinder, the unit will stop AND ALL FURTHER OPERATIONS WILL BE PROHIBITED unit the situation has cleared (moisture has evaporated).

6. **Timer Circuit**

   If the unit is set for unattended recording, and the timer switch is set ON, the unit will shut down and the stop solenoid will activate to return all of the operation buttons to their OFF positions.

7. **Power Interrupt**

   When the unit is turned off, the stop solenoid momentarily activates to return all of the operation buttons to thier OFF positions.

8. **Memory Rewind**

   The rewind action will stop if 000 is reached on the counter.

Transistor Q618 is the transistor which conducts the holding current for the stop solenoid. Transistors Q615 and Q617 are monentarily turned on when the stop solenoid activated to ensure the engagement of the solenoid plunger. See Fig. 32 for the stop solenoid diagram.

2. Pressure Roller Solenoid

The purpose of the pressure roller solenoid circuit is to engage the pressure roller by passing current through the solenoid. The pressure roller assures smooth tape travel when it engages against the capstan shaft.
The circuit must also disengage the pressure roller for the stop and pause mode. Basically, all the circuit has to do is to turn the pressure roller solenoid ON and OFF.

3. Loading and Unloading

The loading/unloading circuit controls the loading motor in the loading and unloading modes. It is also involved in controlling the capstan speed during the loading or unloading modes.

4. Capstan Motor Speed Control

The capstan motor drives the capstan as well as the tape reels. The exact speed of the motor is controlled by the control circuit board. However, it is the transport board that puts the capstan motor at approximately the correct speed.
For instance, during recording or playback, the transport board puts the capstan motor at a certain speed which is about correct to drive the capstan and tape reels. The exact speed of the capstan is controlled by the servo board.
But during rewind and fast forward, the exact speed of the capstan does not matter. (Rewind and fast forward are performed inside the cassette, not by the capstan and pressure roller.) Also, it is desirable to have the reels move faster to perform a true rewind and fast forward action. It is the purpose of the transport board to increase the capstan motor speed for rewind and fast forward.
Also, during unloading the tape is would back into the supply reel. The supply reel is driven by the capstan motor, as an extra measure to protect the tape. The capstan motor speed is reduced during the unloading process to that the tape can be gently wound, with less torque, back on to the supply reel. The only exception to this would be in the case of moisture. If moisture or condensation formed on the tape or video head cylinder, the chances are good that the tape will stick to the cylinder or on any metal surface. So, if moisture is detected, the unit will unload the tape with increased torque to be sure that it does not stick into any surface.

Luminance Process Section

MAIN FEATURES

1. Introduction of New IC's

ITEM	PART NO.	FUNCTION	FUNCTION DETAILED
A	AN6300	Video Recording	AGC, CLAMP, WHITE/DARK CLIPPERS, FM MOD, B/W-colour SW
B	AN6320	Head Amp	HEAD AMP, HEAD SW
C	AN6321	Video Playback	LIMITER, FM DEMOD, DROPOUT COMPENSATOR, NOISE CANCELLER, E-E/V-V SW

2. Keyed AGC

AGC response is greatly improved by the introduction of Keyed AGC method.

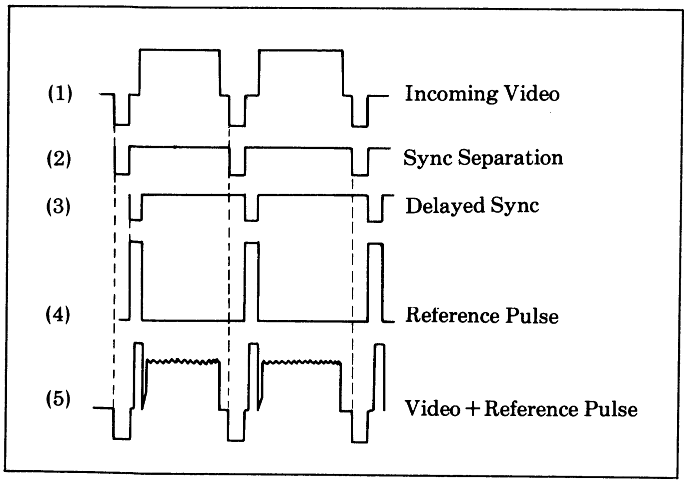

(1)
Incoming Video
(2)
Sync Separation
(3)
Delayed Sync
(4)
Reference Pulse
(5)
Video + Reference Pulse

Fig. 33

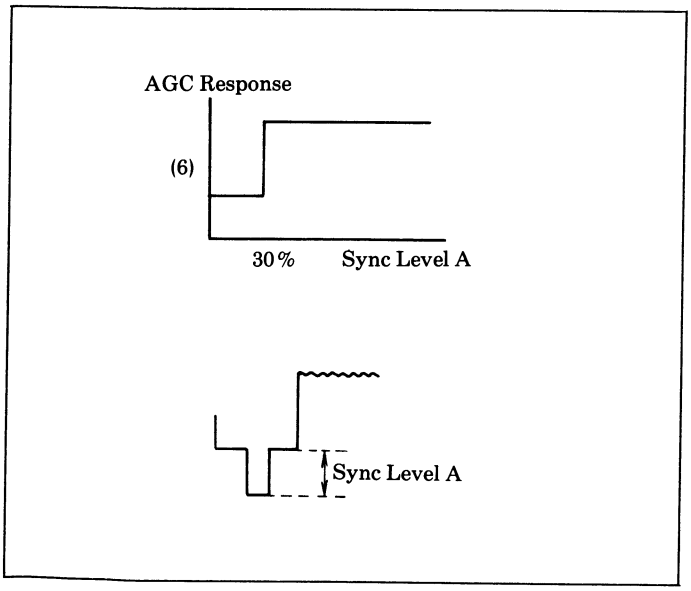

AGC Response
(6)
30%
Sync Level A
Sync Level A

Fig. 34

3. Transient Response Improvement for D.O.C. Pulse

(Improvement for Drop Out Compensator)

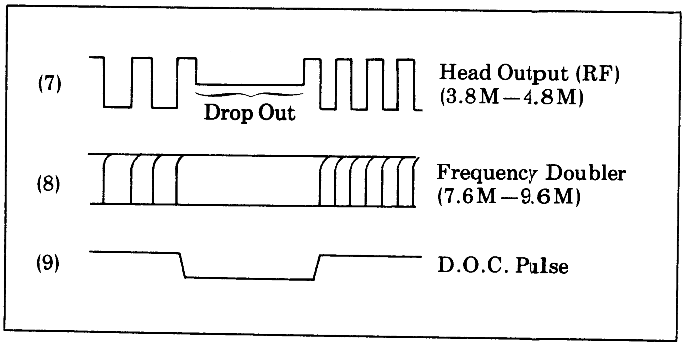

(7)
Drop Out
Head Output (RF)
(3.8M—4.8M)
(8)
Frequency Doubler
(7.6M—9.6M)
(9)
D.O.C. Pulse

Fig. 35

- * Since the head output frequencies are doubled, the transient response of D.O.C. pulse can be improved.
- * In addition to above improvement, the Drop Out detection sensitivity can be improved by adjusting the control R3137 (RF LEVEL ADJ).

  Because, by adjusting the control, the input level for D.O.C. is always same regardless of video head output level, resulting in higher sensitivity for D.O.C.

4. Overall Transient Response Improvement

By compensating the head amp group delay by FL303 and L322, 323, 325, C388, 389, 390, 391, better transient response can be obtained, resulting in less preshoot or noisy vertical line on a TV monitor.

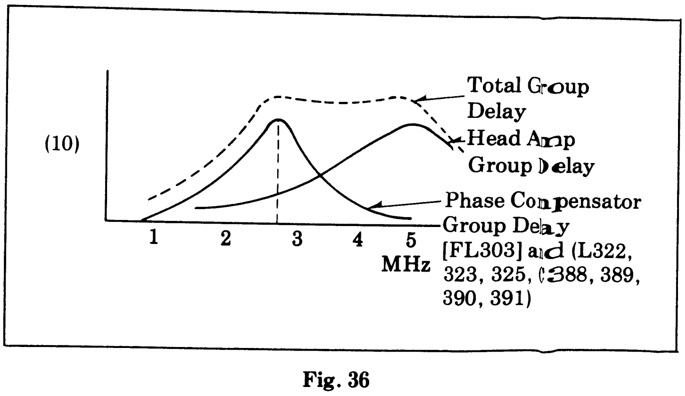


Fig. 36

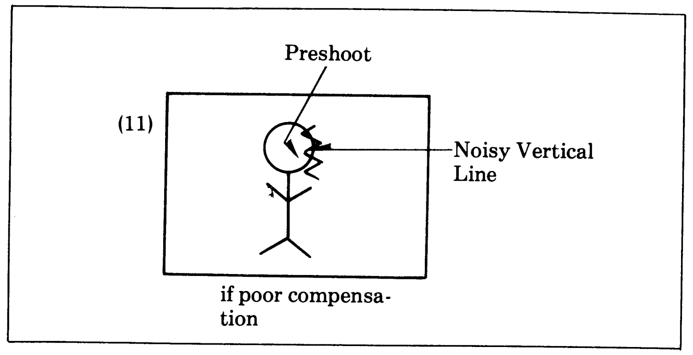

Preshoot
(11)
Noisy Vertical Line
if poor compensa- tion

Fig. 37

GENERAL EXPLANATION

Refer to the attached Charts 1 and 2.

RECORDING PROCESS

- * **Connector P21 (1)**
  The incoming video appears at TP301 (1 Vp-p).
- * **FL301 (5 MHz LPF)**
  Thanks to this L.P.F., Only video (without high frequency noise components and sound carrier (5 MHz).
- * **AGC (Keyed AGC)**
  By using the keyed AGC method, steady video level can be obtained, even through the incoming video level is not exact 1 Vp-p.
- * **FL302 (3.0 MHz LPF)**
  Incoming Video (A) Colour 4.43 MHz Sub Carrier is eliminated by this filter.
  (B) B/W The AGC output goes to the amplifier (IC301 (19)).
  Above (A) and (B) switching is performed inside the IC301.
- * **Non-linear Emphasis (between TP303 & TP304)**
  As you well know, the higher pre-emphasis response should be changed according to the input video level.
  (The lower the input level, the steeper the response should be.)
- * **Dark/White Clipper**
  Dark Clip 150%
  White Clip......160%
  Since the video signal includes excessive overshoot and undershoot because of preemphasis action at the former stage, they should be clipped to prevent the overmodulation at the next stage (FM modulator).
- * **FM Modulator**
  Video 0—5 MHz—FM: Sync Tip 3.8 MHz
  Peak White 4.8 MHz

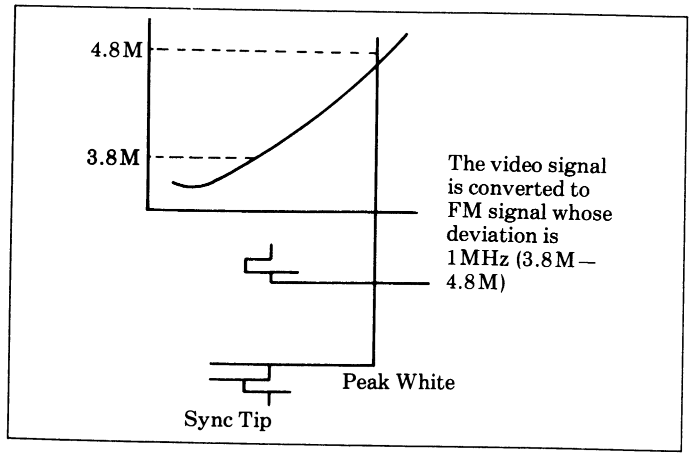


Fig. 38

* **B/W-Colour Switching (Q307, Q308)**

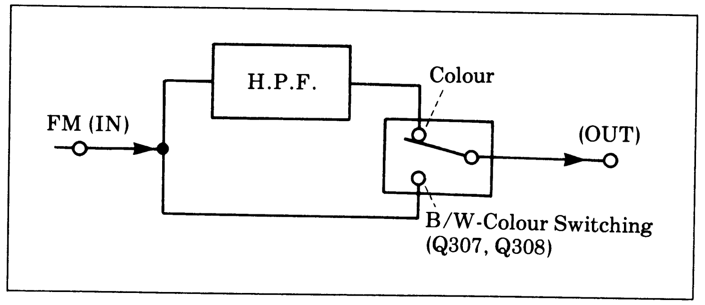

H.P.F.
Colour
FM (IN)
(OUT)
B/W-Colour Switching (Q307, Q308)

Fig. 39

The H.P.F. consists of L304, C329, C330, R342 and L305.
* Frequency Response of H.P.F.

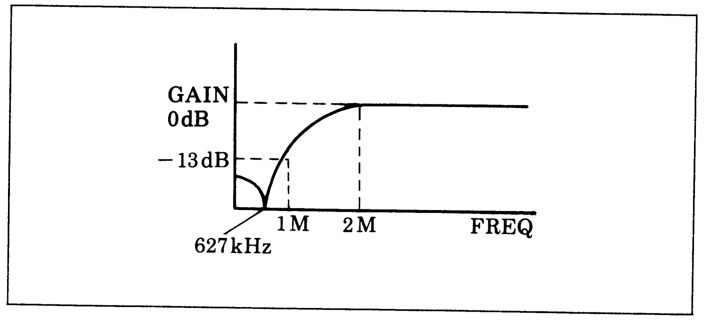


Fig. 40

* **Y-C Mixing (Q501 (B))**

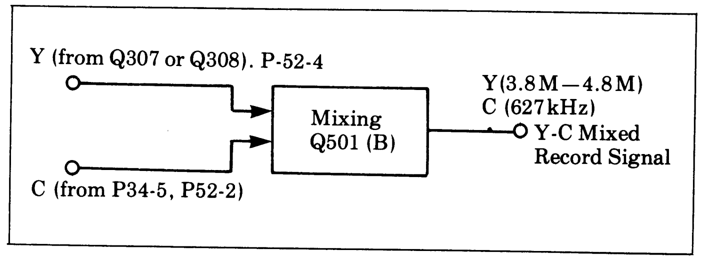

Y (from Q307 or Q308). P-52-4
Mixing Q501 (B)
Y(3.8M—4.8M)
C (627kHz)
Y-C Mixed Record Signal
C (from P34-5, P52-2)

Fig. 41

* **Record Amp (Q501, Q502, Q503, Q504)**

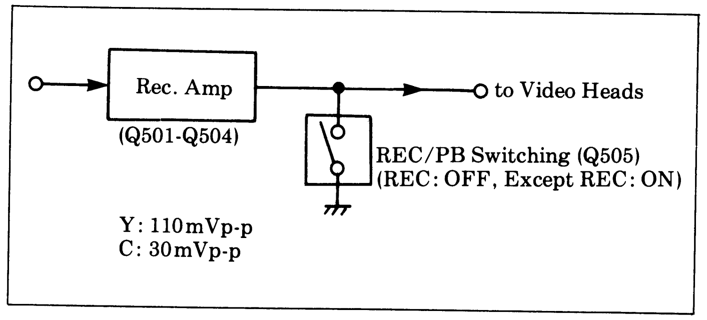
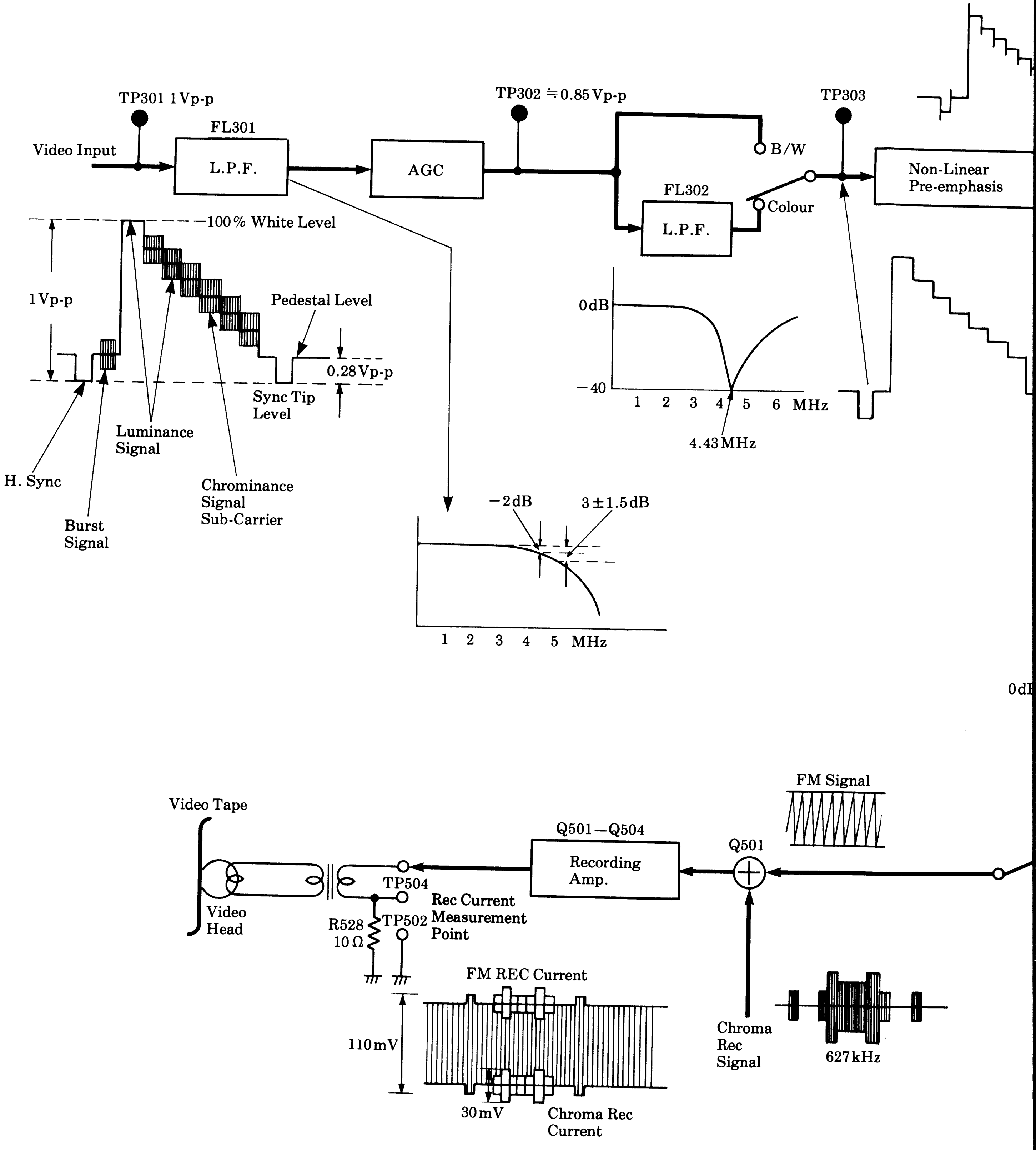
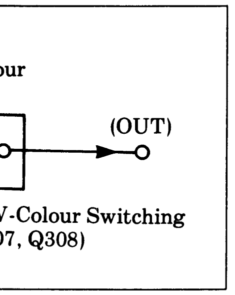

Rec. Amp
(Q501-Q504)
to Video Heads
REC/PB Switching (Q505)
(REC: OFF, Except REC: ON)
Y: 110mVp-p
C: 30mVp-p

Fig. 42

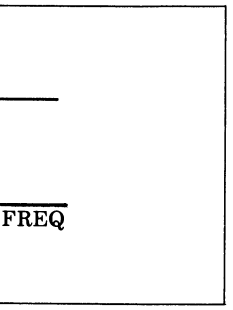
Chart 1 The Keypoint of Luminance Circuit Section

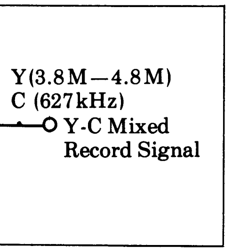
1. PAL Colour Video Signal, Recording Process


TP301 1Vp-p
FL301
Video Input
L.P.F.
AGC
TP302 ≒0.85Vp-p
B/W
FL302
L.P.F.
Colour
TP303
Non-Linear Pre-emphasis
100% White Level
1Vp-p
Pedestal Level
0.28Vp-p
Sync Tip Level
Luminance Signal
H. Sync
Burst Signal
Chrominance Signal Sub-Carrier
0dB
−40
1 2 3 4 5 6 MHz
4.43MHz
−2dB
3±1.5dB
1 2 3 4 5 MHz
0dB
Video Tape
Video Head
FM Signal
Q501—Q504
Recording Amp.
Q501
TP504
Rec Current Measurement Point
R528 10Ω
TP502
FM REC Current
110mV
30mV
Chroma Rec Current
Chroma Rec Signal
627kHz


our
(OUT)
-Colour Switching
7, Q308)

42 and L305.




Y(3.8M−4.8M)
C (627kHz)
Y-C Mixed
Record Signal

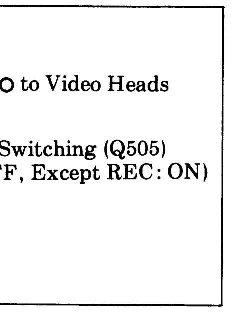

to Video Heads
Switching (Q505)
F, Except REC: ON)

Chart 1 The Keypoint of Luminance Circuit Section

1. PAL Colour Video Signal, Recording Process

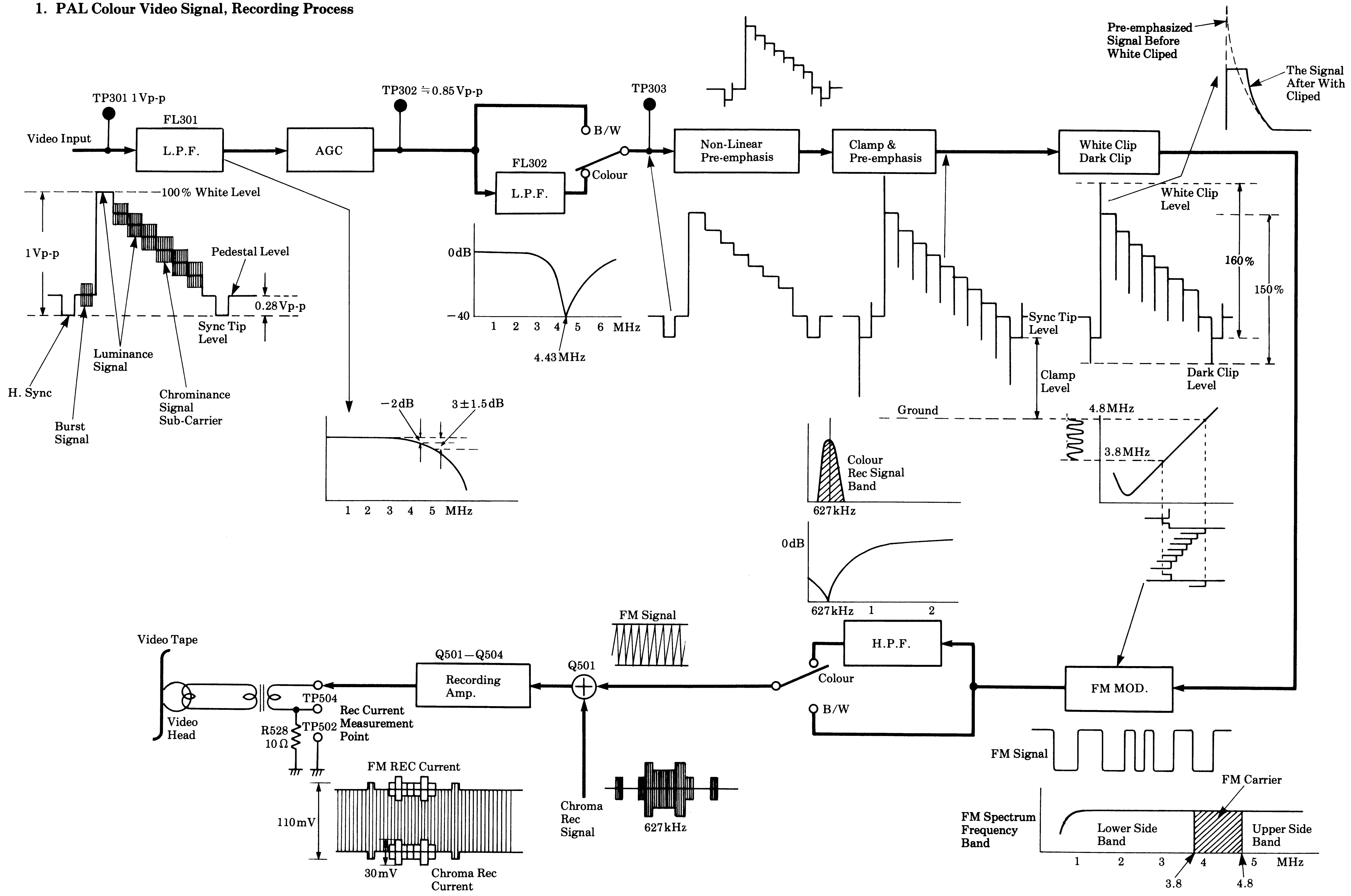
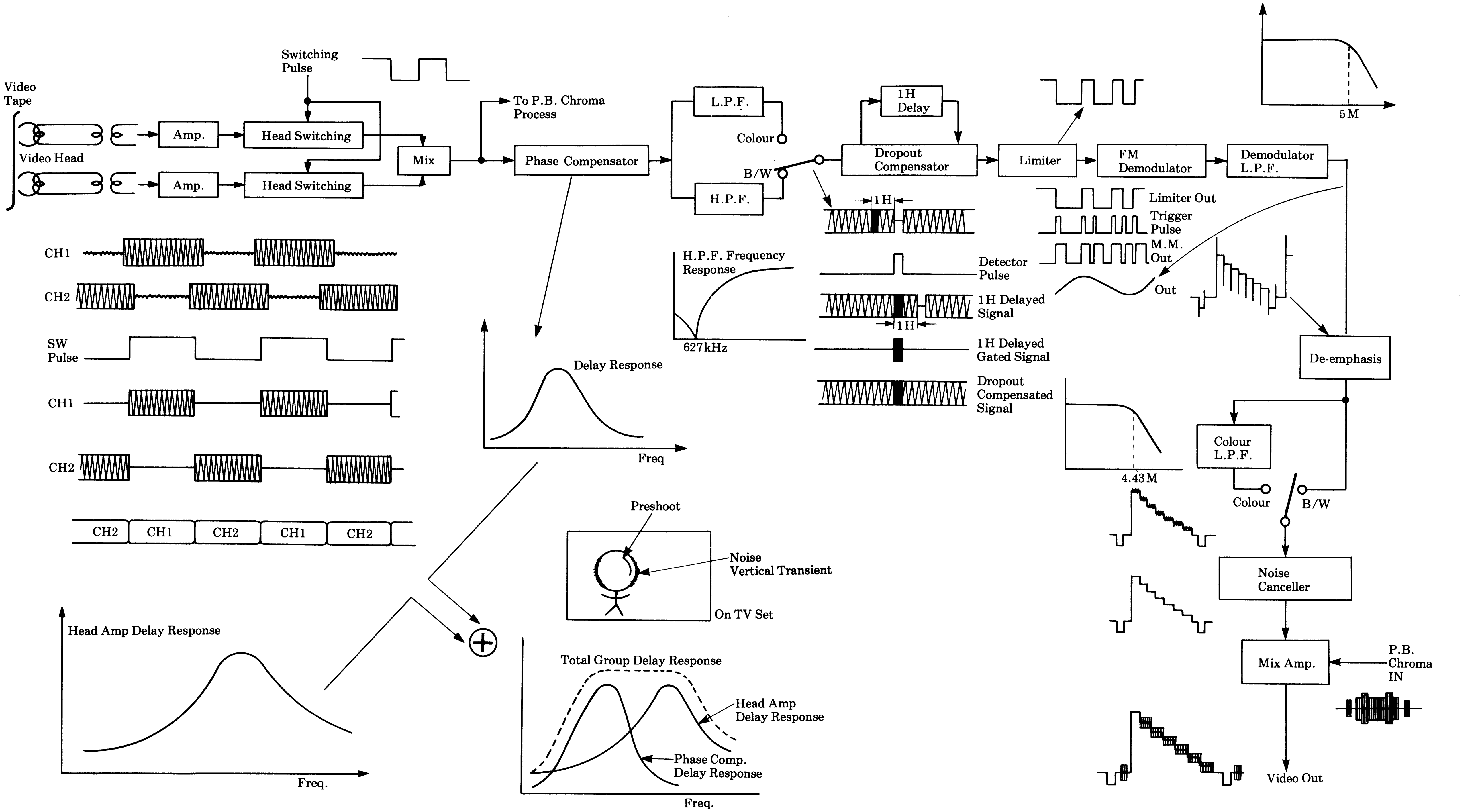

TP301 1Vp-p
Video Input
FL301
L.P.F.
AGC
TP302 ≒0.85Vp-p
FL302
L.P.F.
B/W
Colour
TP303
Non-Linear
Pre-emphasis
Clamp &
Pre-emphasis
White Clip
Dark Clip
Pre-emphasized
Signal Before
White Cliped
The Signal
After With
Cliped
100% White Level
1Vp-p
Pedestal Level
0.28Vp-p
Sync Tip
Level
Luminance
Signal
H. Sync
Burst
Signal
Chrominance
Signal
Sub-Carrier
−2dB
3±1.5dB
1 2 3 4 5 MHz
0dB
−40
1 2 3 4 5 6 MHz
4.43MHz
Sync Tip
Level
Clamp
Level
Ground
White Clip
Level
160%
150%
Dark Clip
Level
4.8MHz
3.8MHz
Colour
Rec Signal
Band
627kHz
0dB
627kHz 1 2
H.P.F.
FM MOD.
Colour
B/W
FM Signal
Q501
Q501−Q504
Recording
Amp.
Video Tape
Video
Head
TP504
Rec Current
Measurement
Point
R528
10Ω
TP502
FM REC Current
110mV
30mV
Chroma Rec
Current
Chroma
Rec
Signal
627kHz
FM Signal
FM Carrier
FM Spectrum
Frequency
Band
Lower Side
Band
Upper Side
Band
1 2 3 4 5 MHz
3.8
4.8

Chart 2 The Keypoint of Luminance Circuit Section

2. PAL Colour Video Signal, Playback Process



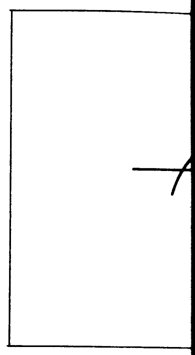
Switching Pulse
Video Tape
Video Head
Amp.
Amp.
Head Switching
Head Switching
Mix
To P.B. Chroma Process
Phase Compensator
L.P.F.
Colour
B/W
H.P.F.
1H Delay
Dropout Compensator
Limiter
FM Demodulator
Demodulator L.P.F.
5M
CH1
CH2
SW Pulse
CH1
CH2
CH2
CH1
CH2
CH1
CH2
Delay Response
Freq
H.P.F. Frequency Response
627kHz
1H
Detector Pulse
1H Delayed Signal
1H
1H Delayed Gated Signal
Dropout Compensated Signal
Limiter Out
Trigger Pulse
M.M. Out
Out
De-emphasis
4.43M
Colour L.P.F.
Colour
B/W
Noise Canceller
Mix Amp.
P.B. Chroma IN
Video Out
Preshoot
Noise Vertical Transient
On TV Set
Head Amp Delay Response
Freq.
Total Group Delay Response
Head Amp Delay Response
Phase Comp. Delay Response
Freq.

If we haven't this phase compensator, we have stronger preshoot and neisy vertical line at picture's **transient position.**

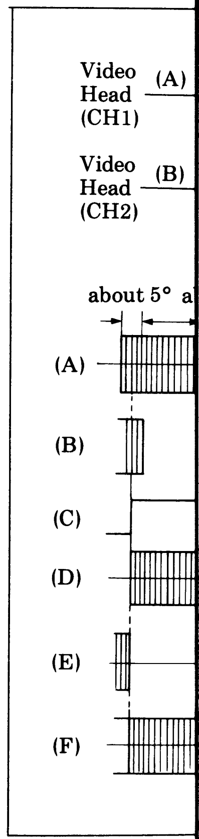
PLAYBACK F

- **Head Amp & He**

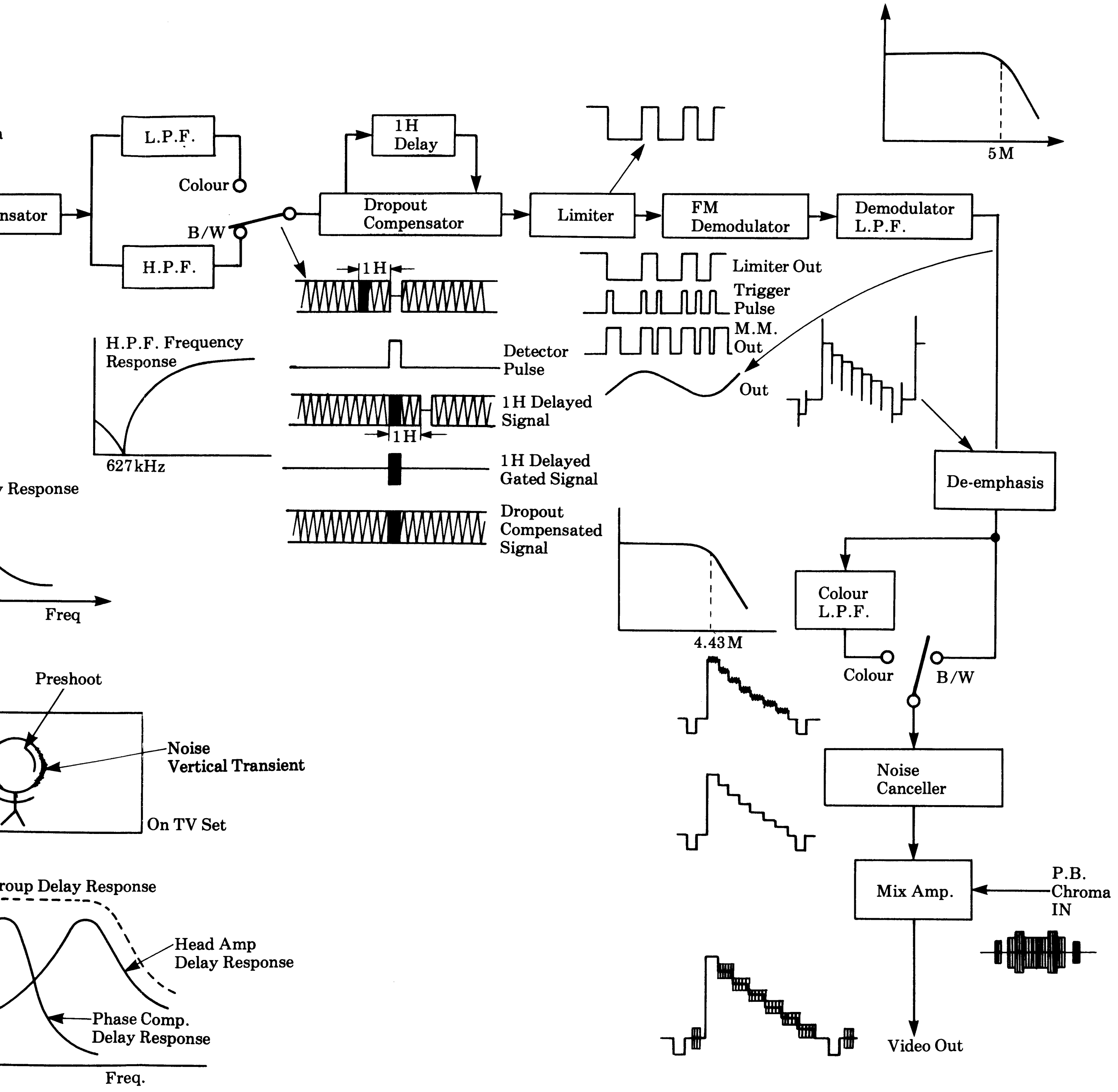
In the recording
627kHz) was re
the upper cylind
To prevent the r
video tape is to
below.



When the above
will be required.



Video Head (CH1)
(A)
Video Head (CH2)
(B)
about 5° a
(A)
(B)
(C)
(D)
(E)
(F)


L.P.F.
1H Delay
5M
nsator
Colour
B/W
Dropout Compensator
Limiter
FM Demodulator
Demodulator L.P.F.
H.P.F.
1H
Limiter Out
Trigger Pulse
M.M. Out
H.P.F. Frequency Response
Detector Pulse
Out
1H Delayed Signal
1H
627kHz
1H Delayed Gated Signal
De-emphasis
Response
Dropout Compensated Signal
Colour L.P.F.
Freq
4.43M
Colour
B/W
Preshoot
Noise
Vertical Transient
Noise Canceller
On TV Set
roup Delay Response
Mix Amp.
P.B. Chroma IN
Head Amp Delay Response
Phase Comp. Delay Response
Freq.
Video Out

this phase compensator,
nger preshoot and neisy
t picture's transient position.

PLAYBACK PROCESS

*** Head Amp & Head Switching (IC501)**

In the recording process, a video signal (Y: 3.8M—4.8M FM, C: 627kHz) was recorded by two video heads which are located on the upper cylinder exactly 180° apart from each other.
To prevent the noise from appearing at the switching portions, a video tape is touching on the cylinder more than 180° as shown below.

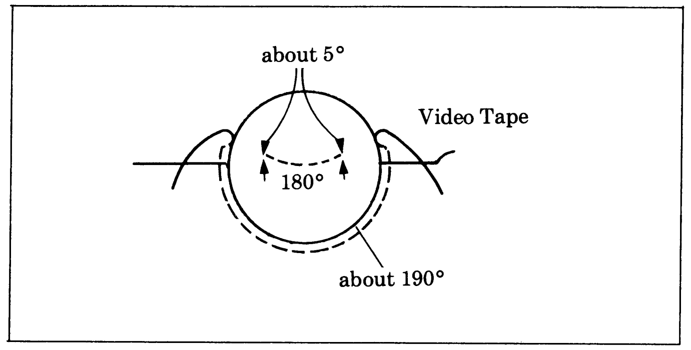

about 5°
Video Tape
180°
about 190°

Fig. 43

When the above signal is reproduced, the head switching circuit will be required.

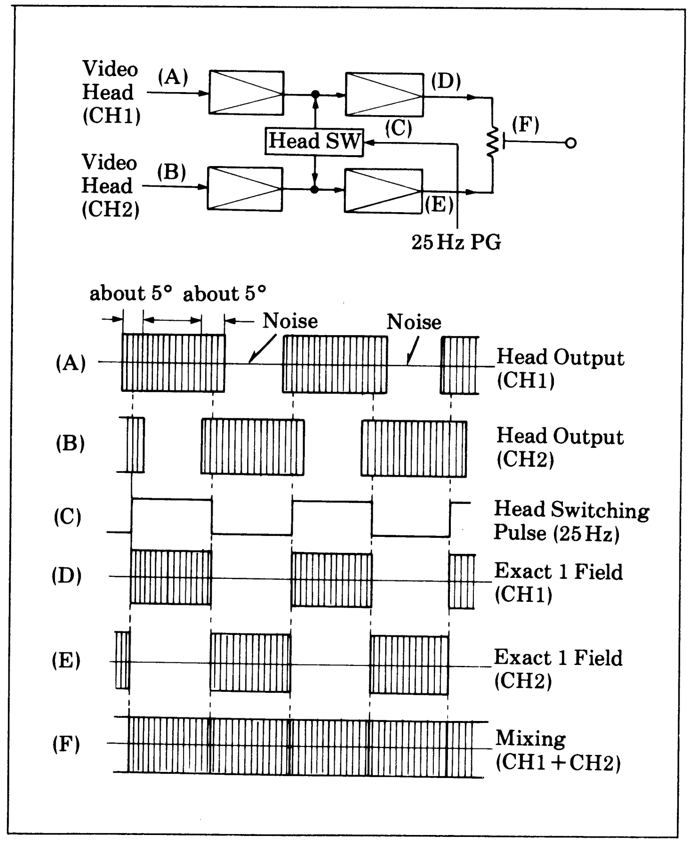

Video Head (CH1)
(A)
(D)
Head SW
(C)
(F)
Video Head (CH2)
(B)
(E)
25Hz PG
about 5°
about 5°
Noise
Noise
(A)
Head Output (CH1)
(B)
Head Output (CH2)
(C)
Head Switching Pulse (25Hz)
(D)
Exact 1 Field (CH1)
(E)
Exact 1 Field (CH2)
(F)
Mixing (CH1+CH2)

Fig. 44

*** FM Out From Head Amp**

The RF Output is sent to Phase Compensator ((FL303) and (L322, 323, 325, C387—390)) for compensation of Head Amp Delay (Refer to Item 5 of Main Features), L.P.F. of 627kHz Chroma separation.

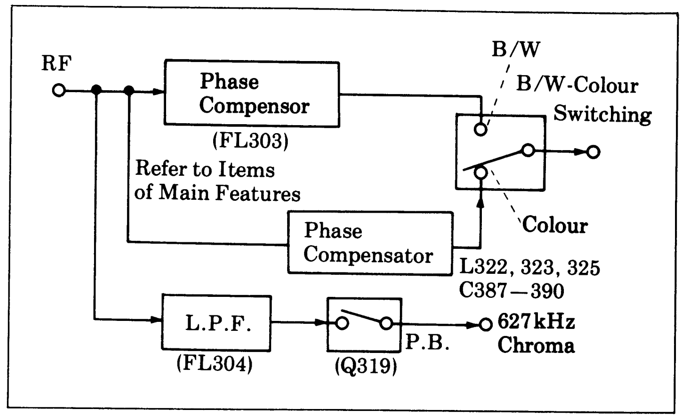

RF
Phase Compensor
(FL303)
Refer to Items of Main Features
B/W
B/W-Colour Switching
Colour
Phase Compensator
L322, 323, 325
C387—390
L.P.F.
(FL304)
(Q319)
P.B.
627kHz Chroma

Fig. 45

*** Drop Out Compensator**

If drop out occurs, thanks to the drop out compensator, the portion will be compensated by the 1H delayed signal.
(Refer to Item 4 of Main Features).

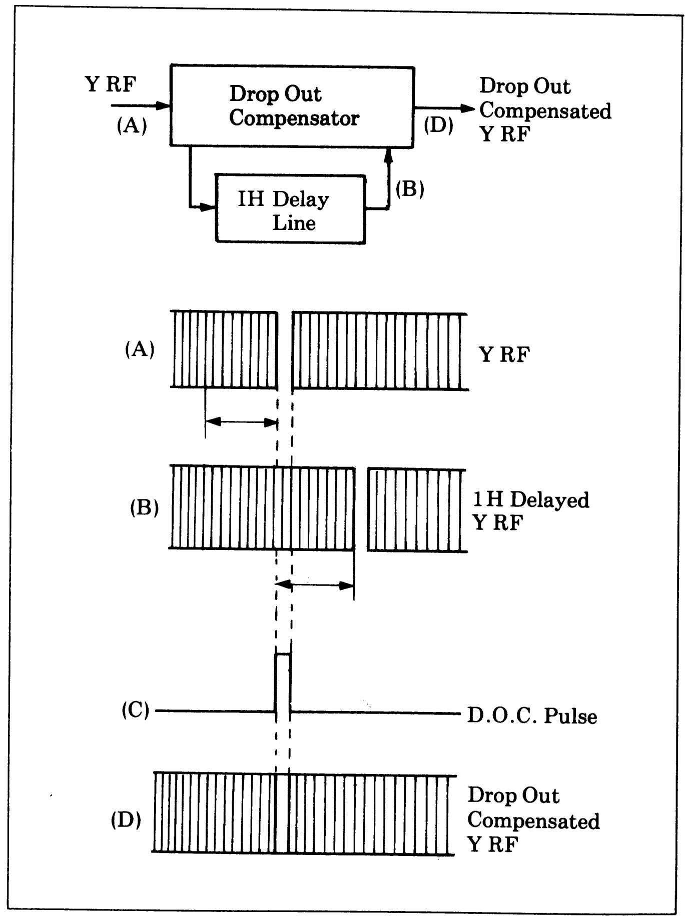

Y RF
(A)
Drop Out Compensator
(D)
Drop Out Compensated Y RF
IH Delay Line
(B)
(A)
Y RF
(B)
1H Delayed Y RF
(C)
D.O.C. Pulse
(D)
Drop Out Compensated Y RF

Fig. 46

- **FM Demodulator**

The RF signal in which drop out was contained was compensated by the Drop Out Compensator. The signal is then sent to the FM Demodulator after passing through limiter circuit.

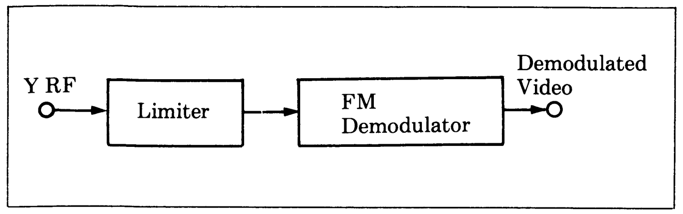

Y RF
Limiter
FM Demodulator
Demodulated Video

Fig. 47

How to demodulate the RF signal to video is described below.

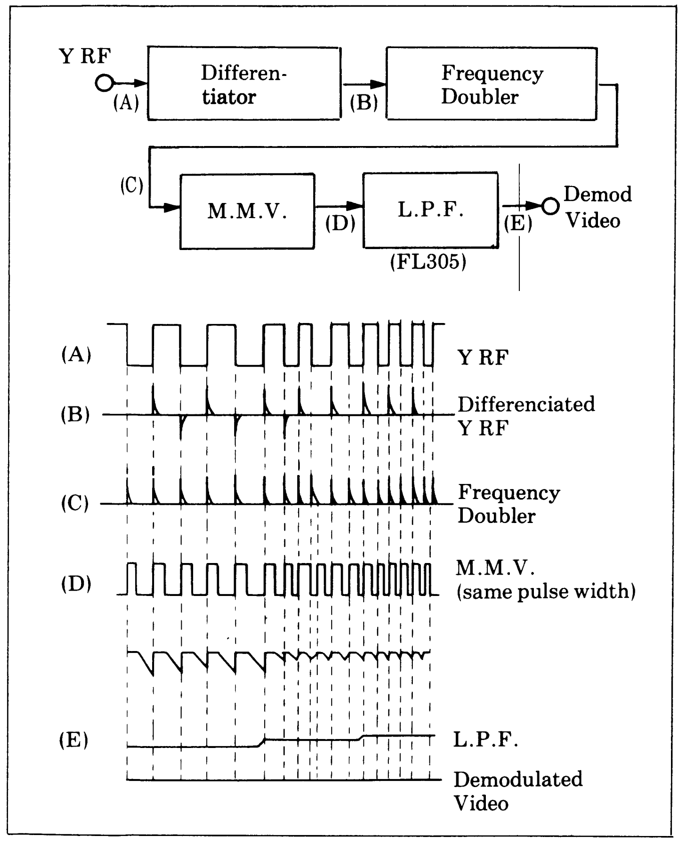

Y RF
(A)
Differen-tiator
(B)
Frequency Doubler
(C)
M.M.V.
(D)
L.P.F.
(E)
(FL305)
Demod Video
(A) Y RF
(B) Differenciated Y RF
(C) Frequency Doubler
(D) M.M.V. (same pulse width)
(E) L.P.F.
Demodulated Video

Fig. 48

- **Y-C Mixing**

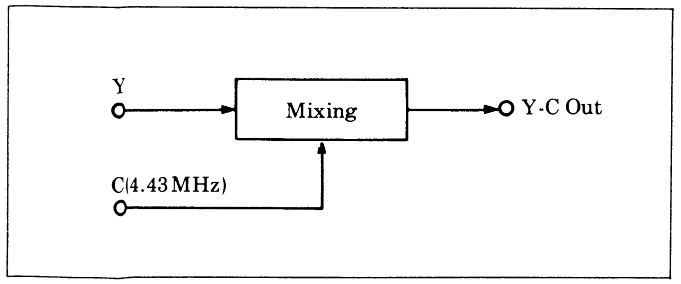

Y
Mixing
Y-C Out
C(4.43MHz)

Fig. 49

- **Deemphasis**

In the Record process, the video signal was pre-emphasized. Therefore, in the Playback process, it should be de-emphasized. The relationship between pre-emphasis and deemphasis is shown below.

RECORD (Pre-emphasis) PLAYBACK (De-emphaphasis) between TP303 & TP304 between Q320 (E) & GND R324, C322, C360, C361, R385.

- **Noise Canceller**

The purpose of the noise canceller is to improve overall signal to noise ratio and works in the following way. Generally speaking, noise lies in the high frequency region, and its amplitude is fairly low.

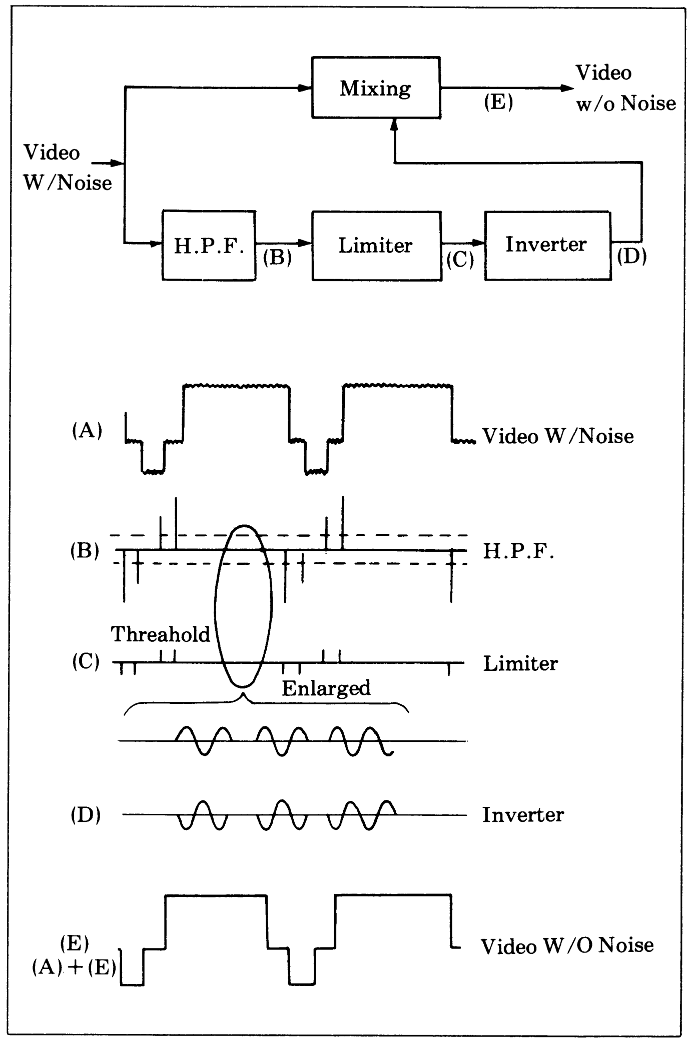
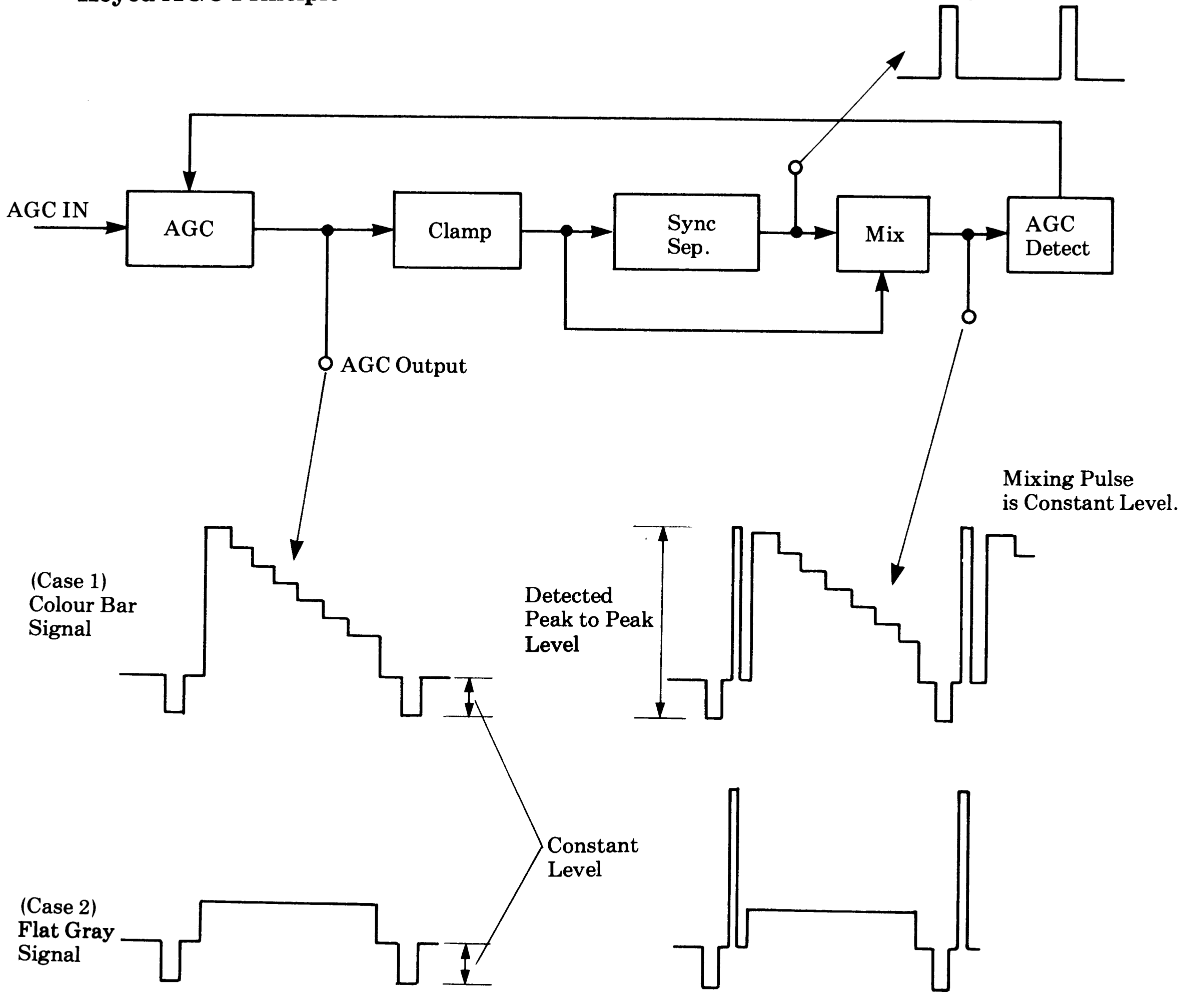

Video W/Noise
Mixing
(E)
Video w/o Noise
H.P.F.
(B)
Limiter
(C)
Inverter
(D)
(A) Video W/Noise
(B) H.P.F.
Threahold
(C) Limiter
Enlarged
(D) Inverter
(E) (A)+(E) Video W/O Noise

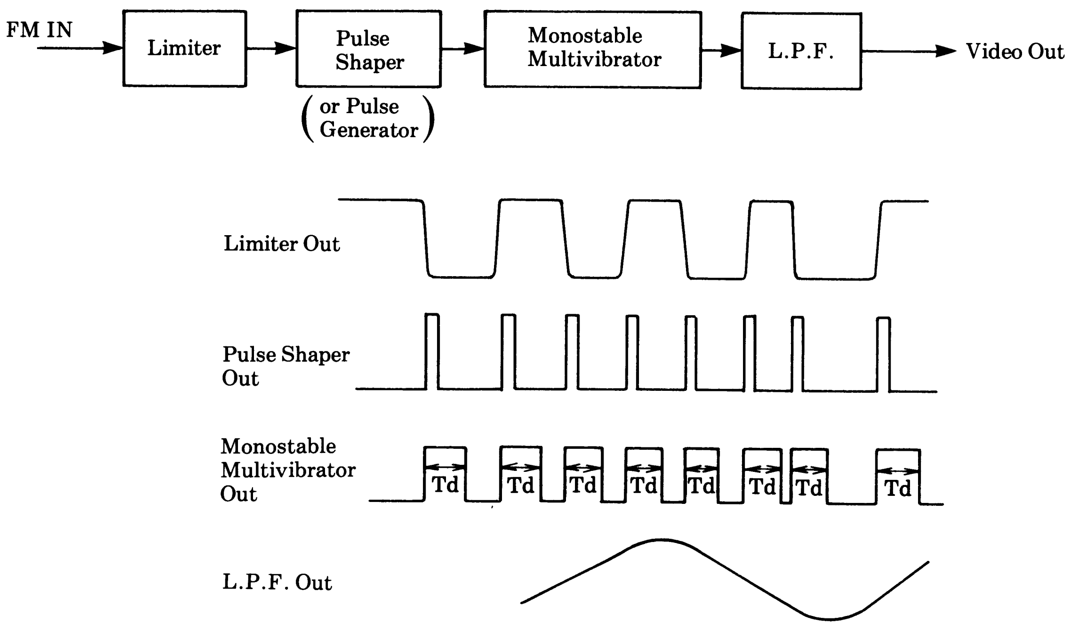
Fig. 50

Chart 3

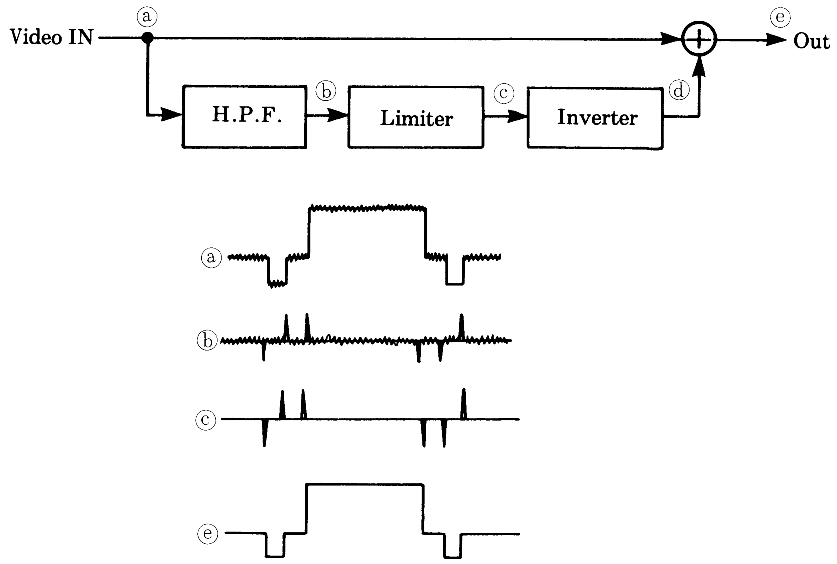
* Keyed AGC Principle


H. Sync
AGC IN
AGC
Clamp
Sync Sep.
Mix
AGC Detect
AGC Output
Mixing Pulse is Constant Level.
(Case 1) Colour Bar Signal
Detected Peak to Peak Level
Constant Level
(Case 2) Flat Gray Signal

* FM Demodulator Principle


FM IN
Limiter
Pulse Shaper
(or Pulse Generator)
Monostable Multivibrator
L.P.F.
Video Out
Limiter Out
Pulse Shaper Out
Monostable Multivibrator Out
Td
L.P.F. Out

* Noise Canceller Principle


Video IN
ⓐ
H.P.F.
ⓑ
Limiter
ⓒ
Inverter
ⓓ
ⓔ
Out
ⓐ
ⓑ
ⓒ
ⓔ

Chrominance Process Section

MAIN FEATURES

1. Introduction of IC

Item	Part No.	Function	Function Detailed
A	AN236	Colour Rec/P.B.	APC Phase Compensator, Killer Phase Compensator, 4.43 MHz V.X.O.
B	AN305	Colour Rec/P.B.	ACC, Killer Amp. Balance Modulator
C	AN337	Colour Rec/P.B.	Sync Sep., AFC Phase Compensator, 2.500 MHz VCO, Balance Modulator
D	AN6342	Colour Rec/P.B.	1/88,672 Frequency Divider
E	AN6061A	Colour Rec/P.B.	H. Sync Sep., 1/4 Divider, 1/40 Divider, 90° Shifted Signal SW, Inverter

1. Playback Band Pass Filter (4.43 MHz)...Block Filter.
2. Field Start Burst Inhibit Circuit is simplified.
3. 4.43 MHz CW for APC REC/PB Switching Circuit is simplified.
4. 50 Hz/4.43 MHz = 1/88,672 Frequency Divider IC805 (AN6342).

GENERAL EXPLANATION

Refer to the Attached Charts 4 and 5.

RECORDING PROCESS

*** BPF (on Luminance Board) (L319, 320, C398)**

An incoming video signal is directly sent to the Band Pass Filter (L319, 320, C398) on the Luminance Process Board.

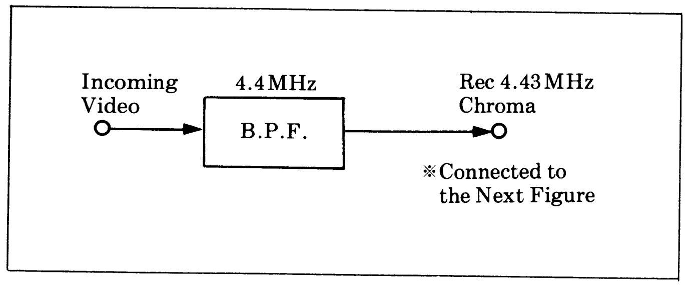

Incoming Video
4.4 MHz
B.P.F.
Rec 4.43 MHz Chroma
※Connected to the Next Figure

Fig. 51

The chrominance signal which was separated by the band pass filter (L319, 320, C398) is sent to the ACC circuit, where the chrominance signal level (Burst Level) is automatically controlled.

*** Balanced Modulator (IC801)**

The record 4.43 MHz Chroma is hetrodyned against a 5.060 MHz CW which is applied from FL803. Two kinds of signals—summed Component (9.49 MHz) and balanced component (627 kHz)—are produced in the Balanced Modulator.

By passing through the Low pass filter (FL801), only 627 kHz (Converted chroma) will be selected. This chroma is mixed with the luminance signal (RF: 3.8 M—4.8 M) at the base of Q501 on the Luminance Process board.

*** 5.060 MHz CW**

The 5.060 MHz CW for the Balanced Modulator (IC801) is produced in the following manner.

Playback 4.43 MHz is applied to the Phase Comparator. The colour phase error is detected by comparing the incoming signal with the 4.43 MHz oscillator. Difference of phase is converted to DC voltage which makes the oscillation frequency of 4.435572 MHz VCO change.

On the other hand, only H syncs are separated from the video signal which appears at J3-(1). The 2.500 MHz VCO is controlled by the AFC output DC level. By the quarter divider, we can achive a 625 kHz signal.

*** ACC/Bal Mod/Killer Amp (IC801)**

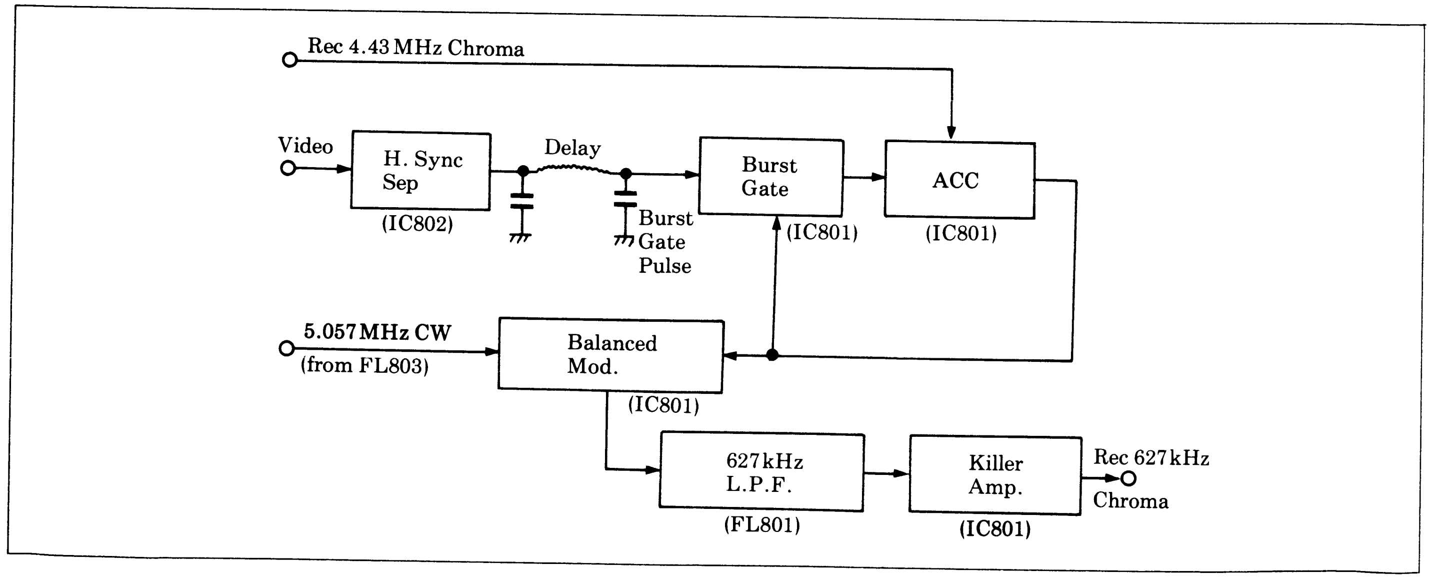

Rec 4.43 MHz Chroma
Video
H. Sync Sep
(IC802)
Delay
Burst Gate Pulse
Burst Gate
(IC801)
ACC
(IC801)
5.057 MHz CW
(from FL803)
Balanced Mod.
(IC801)
627 kHz L.P.F.
(FL801)
Killer Amp.
(IC801)
Rec 627 kHz Chroma

Fig. 52

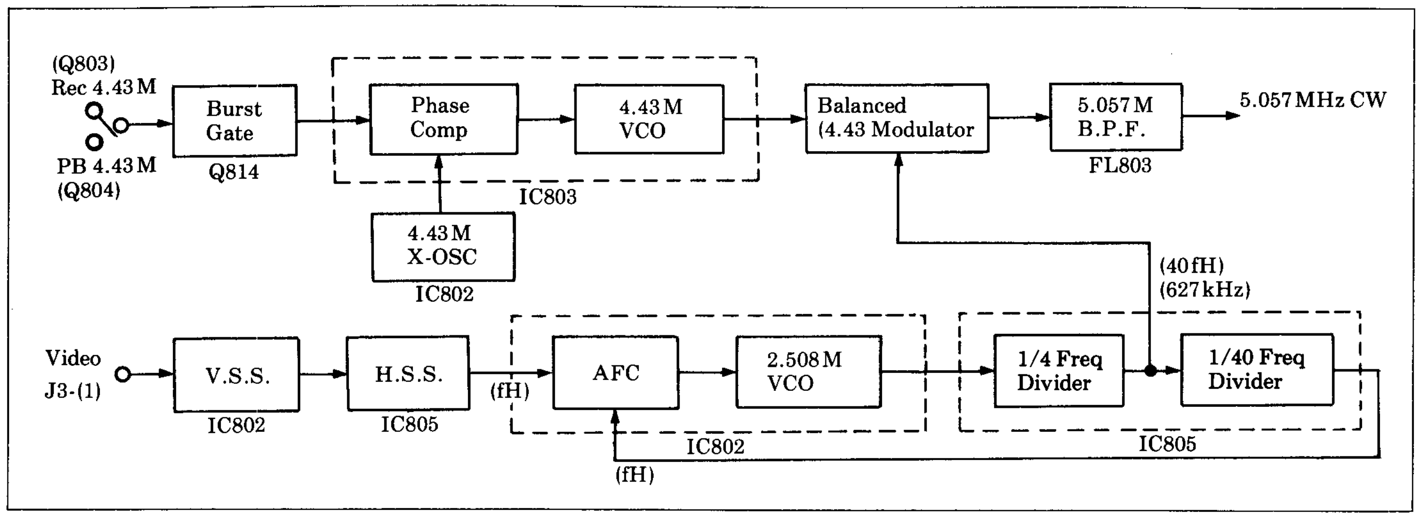

(Q803)
Rec 4.43 M
PB 4.43 M
(Q804)
Burst Gate
Q814
Phase Comp
4.43 M VCO
IC803
4.43 M X-OSC
IC802
Balanced (4.43 Modulator
5.057 M B.P.F.
FL803
5.057 MHz CW
(40 fH)
(627 kHz)
Video
J3-(1)
V.S.S.
IC802
H.S.S.
IC805
(fH)
AFC
2.508 M VCO
IC802
1/4 Freq Divider
1/40 Freq Divider
IC805
(fH)

Fig. 53

In the Balanced Modulator, the 625 kHz is hetrodyned against the 4.435572 MHz. Then the summed component (5.060 MHz) and the balanced component (3.811 MHz) will appear at the output. By passing through the 5.060 MHz band pass filter (FL803), only 5.060 MHz will be selected.

*** 1/88,672 Freq. Divider**

In the playback process, the 4.43 MHz X'tal oscillation frequency is divided into 50 Hz. The 50 Hz is used for servo control.
(In the record process, V syncs are used for servo control).

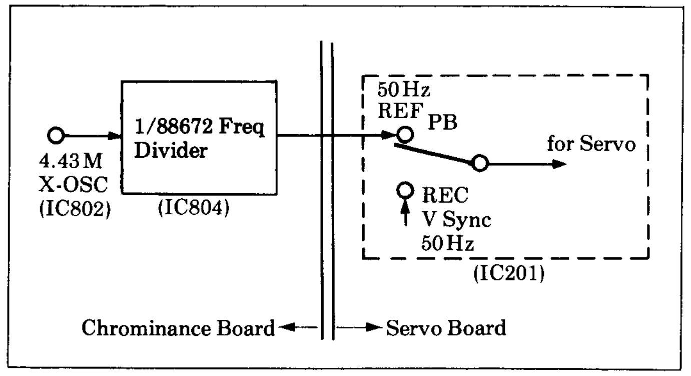

4.43 M
X-OSC
(IC802)
1/88672 Freq Divider
(IC804)
50 Hz
REF
PB
for Servo
REC
V Sync
50 Hz
(IC201)
Chrominance Board
Servo Board

Fig. 54

*** P.B. Colour Killer**

The colour killer circuit is required to detect a video signal whether it is colour or B/W.
If the video signal is colour, Q818 is OFF, resulting colour (H) at TP809.

*** Rec Colour Killer**

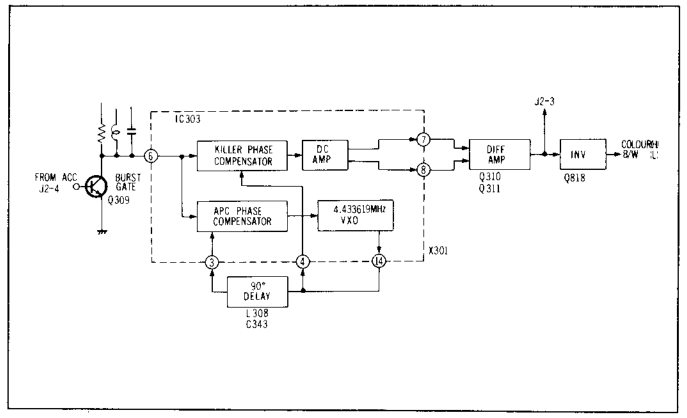

IC303
FROM ACC
J2-4
BURST GATE
Q309
6
KILLER PHASE COMPENSATOR
DC AMP
APC PHASE COMPENSATOR
4.433619MHz VXO
7
8
3
4
14
X301
90° DELAY
L308
C343
J2-3
DIFF AMP
Q310
Q311
INV
Q818
COLOUR(H)
B/W (L)

Fig. 56

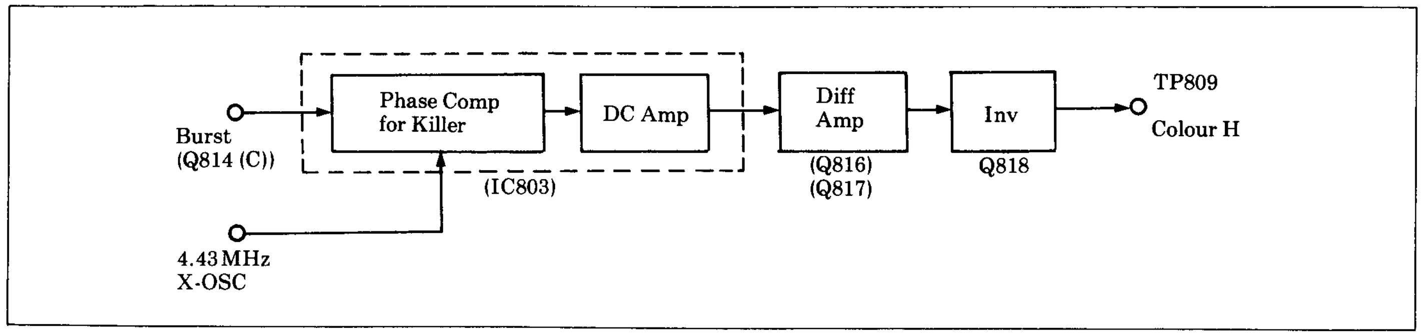
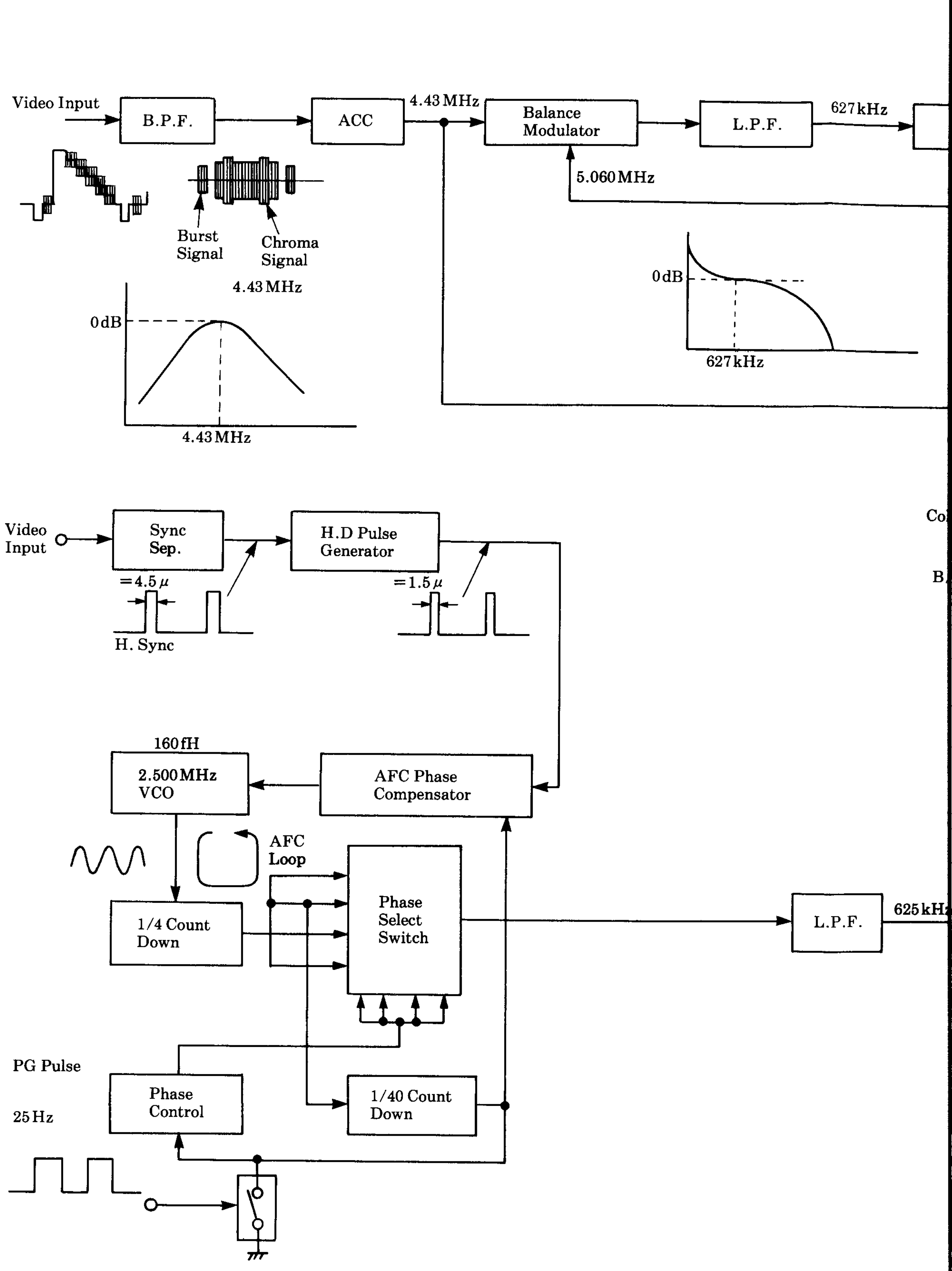
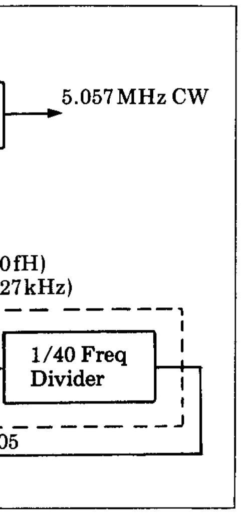

Burst
(Q814 (C))
Phase Comp for Killer
DC Amp
(IC803)
Diff Amp
(Q816)
(Q817)
Inv
Q818
TP809
Colour H
4.43 MHz
X-OSC

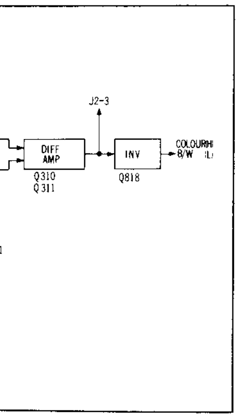
Fig. 55

Chart 4 Chrominance Recording Process


Video Input
B.P.F.
ACC
4.43 MHz
Balance Modulator
L.P.F.
627 kHz
5.060 MHz
Burst Signal
Chroma Signal
4.43 MHz
0 dB
4.43 MHz
0 dB
627 kHz
Video Input
Sync Sep.
=4.5 μ
H. Sync
H.D Pulse Generator
=1.5 μ
160 fH
2.500 MHz VCO
AFC Phase Compensator
AFC Loop
1/4 Count Down
Phase Select Switch
L.P.F.
625 kH
PG Pulse
25 Hz
Phase Control
1/40 Count Down
Co
B



5.057MHz CW
0fH)
27kHz)
1/40 Freq Divider
05



J2-3
DIFF AMP
Q310
Q311
INV
Q618
COLOUR H
B/W L

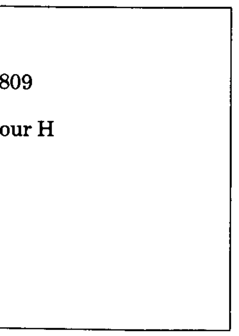
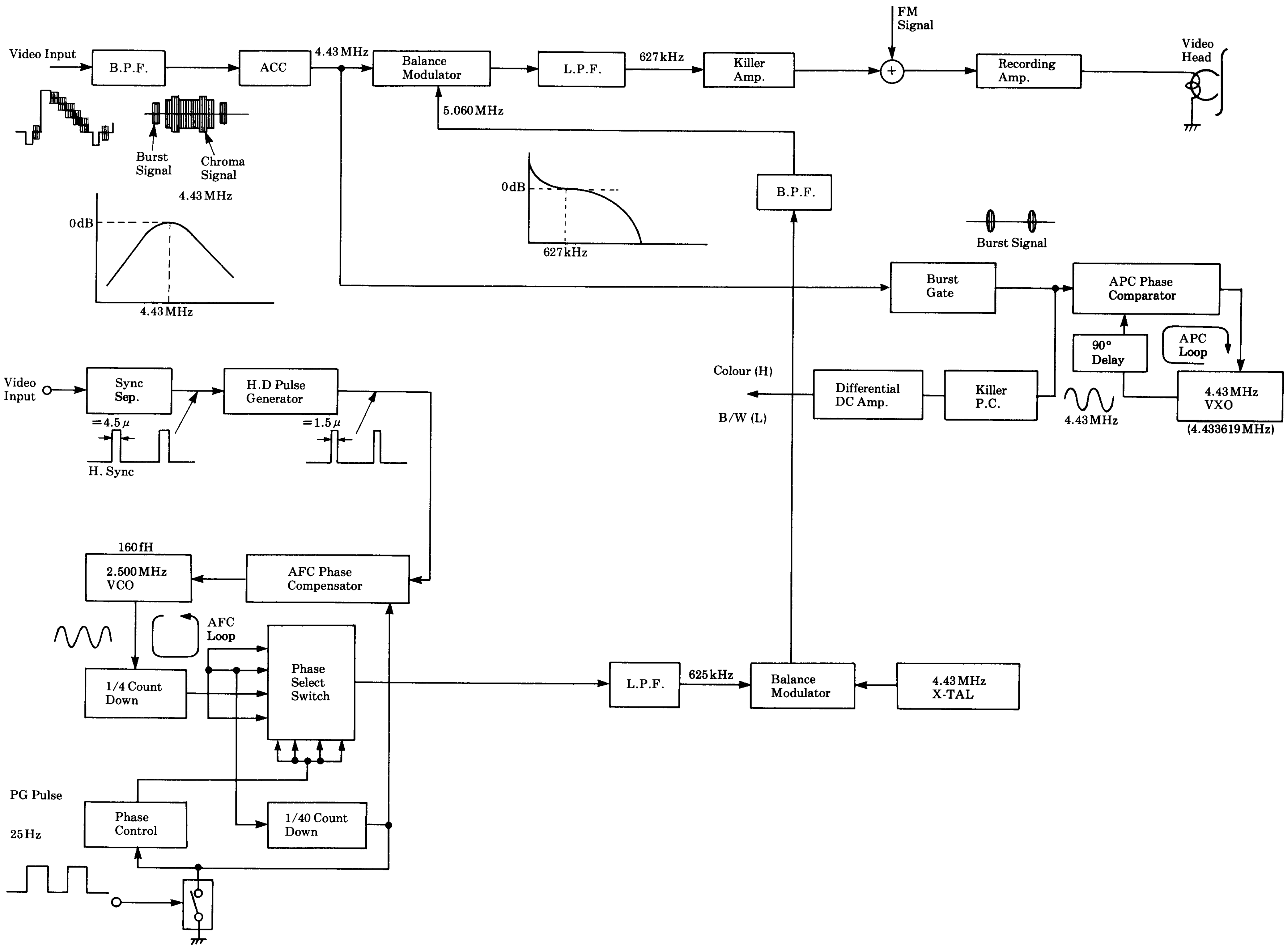
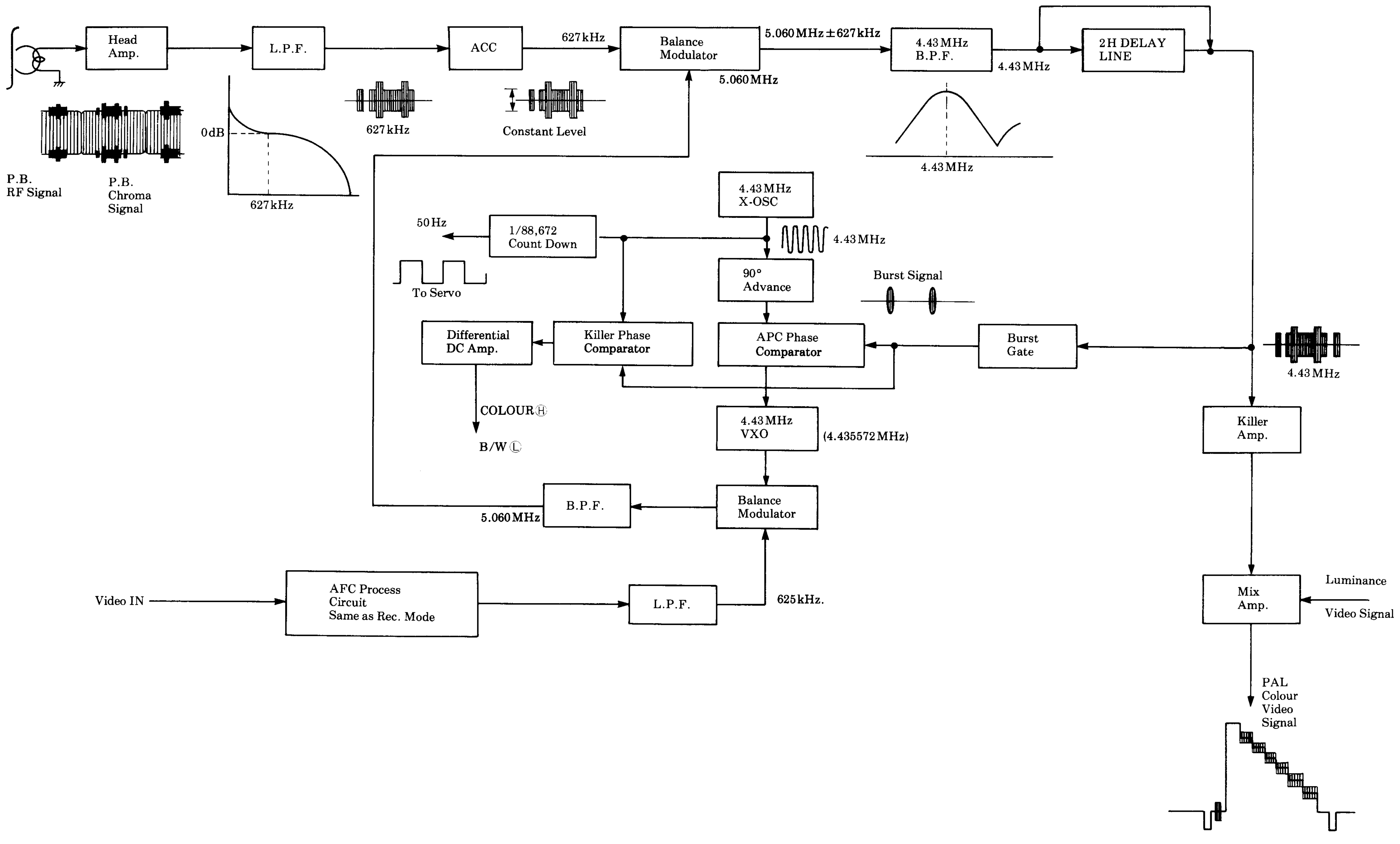


Chart 4 Chrominance Recording Process



Video Input
B.P.F.
ACC
4.43MHz
Balance Modulator
L.P.F.
627kHz
Killer Amp.
FM Signal
Recording Amp.
Video Head
5.060MHz
Burst Signal
Chroma Signal
4.43MHz
0dB
4.43MHz
0dB
627kHz
B.P.F.
Burst Signal
Burst Gate
APC Phase Comparator
90° Delay
APC Loop
4.43MHz VXO
(4.433619MHz)
4.43MHz
Killer P.C.
Differential DC Amp.
Colour (H)
B/W (L)
Video Input
Sync Sep.
H.D Pulse Generator
=4.5 μ
=1.5 μ
H. Sync
160fH
2.500MHz VCO
AFC Phase Compensator
AFC Loop
1/4 Count Down
Phase Select Switch
L.P.F.
625kHz
Balance Modulator
4.43MHz X-TAL
PG Pulse
25Hz
Phase Control
1/40 Count Down

Chart 5 Chrominance Playback Process



Head Amp.
L.P.F.
ACC
627kHz
Balance Modulator
5.060MHz±627kHz
4.43MHz B.P.F.
4.43MHz
2H DELAY LINE
5.060MHz
P.B. RF Signal
P.B. Chroma Signal
0dB
627kHz
627kHz
Constant Level
4.43MHz
4.43MHz X-OSC
4.43MHz
50Hz
1/88,672 Count Down
To Servo
90° Advance
Burst Signal
Differential DC Amp.
Killer Phase Comparator
APC Phase Comparator
Burst Gate
4.43MHz
COLOUR Ⓗ
B/W Ⓛ
4.43MHz VXO
(4.435572MHz)
Killer Amp.
B.P.F.
5.060MHz
Balance Modulator
Video IN
AFC Process Circuit Same as Rec. Mode
L.P.F.
625kHz.
Mix Amp.
Luminance
Video Signal
PAL Colour Video Signal

Servo Section

MAIN FEATURES

1. Introduction of N

Item	
A	A
B	A
C	A

2. Relationship betw

A. Phase Control

Servo	
	REC
CYL	V Syn
CAP	V Syn

B. Speed Control

Servo	R
CYL	Main
CAP	CAP.

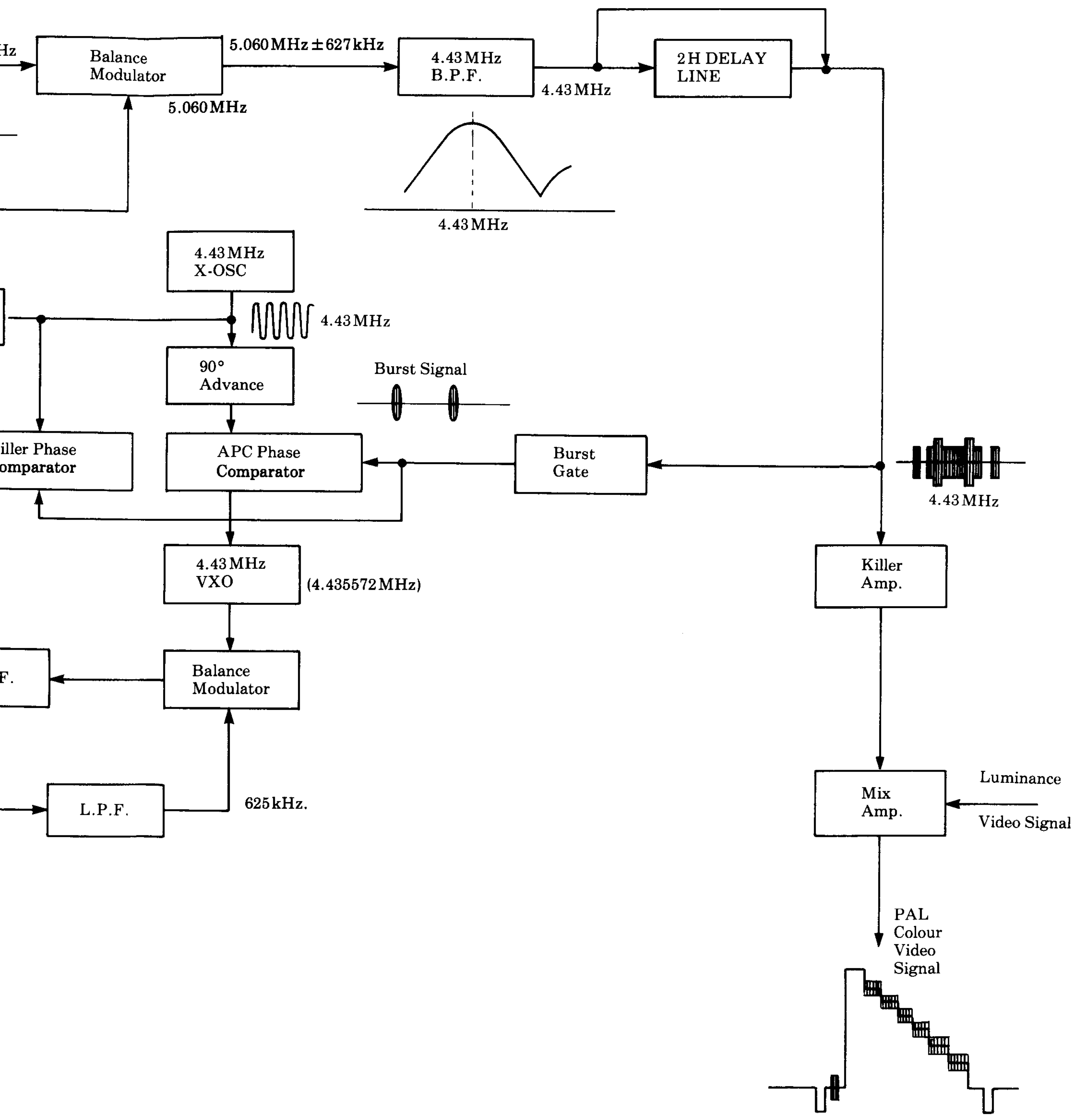
GENERAL EXPLA

Refer to the attached tim

CYLINDER PHASE CO

V Sync—Trapezoid, Cyli

In the Record mode, tele
cylinder phase servo. Ve
video signal in the Lumin
The separated V sync sig
Servo board (Fig. (a)). I
the flip-flop and convert
IC. (Fig. (5)).
On the other hand, the s
manner.
The cylinder PG Head pi
(6). Polarity of those pu
pulse to pin 23 of IC201 a
negative pulse and positiv
up PG shifter signal as sh
sent to Filp-Flop circuit a
Then the duty cycle is con
to trapezoidal so the samp
The sampling voltage is s
of IC201).
On the other hand, the V s
recording control pulse wh



Servo Section

MAIN FEATURES

1. Introduction of New IC's

Item	Part No.	Function	Function Detailed
A	AN6340	Cylinder Servo	CYLINDER SERVO (PHASE & SPEED CONTROL), CTL PULSE AMP
B	AN6341	Capstan Servo	CAPSTAN SERVO (PHASE & SPEED CONTROL)
C	AN6811	1/12 Frequency Divider	1/3×1/2×1/2=1/12

2. Relationship between Trapezoid & Sampling Pulse

A. Phase Control

Servo	Trapezoid		Sampling pulse	
	REC	PB	REC	PB
CYL	V Sync	50Hz Ref. OSC	CTL. PG	CYL. PG
CAP	V Sync	50Hz Ref. OSC	CAP. FG	CTL PULSE

B. Speed Control

Servo	REC	PB
CYL	Main Coil Sig.	Main Coil Sig.
CAP	CAP. FG	CAP. FG

GENERAL EXPLANATION

Refer to the attached timing chart.

CYLINDER PHASE CONTROL (REC)

V Sync—Trapezoid, Cylinder PG—Sampling Pulse

In the Record mode, television vertical sync is the reference for the cylinder phase servo. Vertical Sync are separated from an incoming video signal in the Luminance Process board (IC301).

The separated V sync signal is applied at Connector P22 (3) on the Servo board (Fig. (a)). In IC201, the 50Hz is changed to 25Hz by the flip-flop and converted to the trapezoidal waveform inside the IC. (Fig. (5)).

On the other hand, the sampling pulse is produced in the following manner.

The cylinder PG Head picks up PG pulses (50Hz) as shown in Fig. (6). Polarity of those pulses is detected by Q211 and send positive pulse to pin 23 of IC201 and negative pulse to pin 24 of IC201. Then negative pulse and positive pulse are sent to MM circuits then made up PG shifter signal as shown in Fig. (8) and (9). Then MM output is sent to Filp-Flop circuit and made duty cycle as shown in Fig. (10). Then the duty cycle is converted to samping pulse by MM and added to trapezoidal so the sampling voltage can be made up.

The sampling voltage is sent to MM circuit of Speed Control (pin 13 of IC201).

On the other hand, the V sync is sent to MM circuit and made into a recording control pulse which will be supplied to control head.

CYLINDER SPEED CONTROL (REC, P.B)

Main Coil Signal—Trapezoid and Sampling Pulse

Reference signal for speed control (200Hz) is picked up by main coil signal (Q212, 213). The 200Hz is count down to 100Hz by Flip-Flop and split to two ways, one signal is sent to MM, and the other is converted to trapezoid generator then the output of MM and output of trapezoid generator are mixed and made into a sampling voltage which is sent to D.D motor Drive circuit.

CAPSTAN PHASE CONTROL (REC)

V Sync—Trapezoid, Capstan FG—Sampling Pulse

V sync is applied to pin 24 of IC201.

The 50Hz is changed to 25Hz by Flip-Flop and this signal to converted to trapezoid as shown in (13).

On the other hand, the FG signal is picked up by FG coil (600Hz).

The FG signals is changed to 300Hz by Flip-Flip (In the IC203).

The 300Hz output (5 pin of IC203) is sent to IC202 (pin 6) for dividing to 1/12 divider (25Hz). The 25Hz (8 pin of IC202) is sent to 15 pin of IC203 and made the sampling pulse as shown in (14).

The trapezoid and sampling pulse is sampled and made into sampling voltage.

The sampling voltage is sent to MM circuit (pin 3 of IC203).

CAPSTAN SPEED CONTROL (REC, P.B)

The capstan FG is applied at connector P21 (2). And the capstan FG picked up 600Hz sinewave signal. The 600Hz signal is sent to IC203 (16) and it is changed to 300Hz by Filp-Flop.

The 300 Hz is splitted two ways. One signal is sent to MM circuit and the other signal is sent to trapezoid.
Then the two signals are samples and made into sampling voltage.
The sampling voltage is sent to capstan motor drive circuit.

CYLINDER PHASE CONTROL (P.B)

In recording mode, the trapezoid is made up by V sync but in Playback mode. The trapezoid is made up by reference 50 Hz signal which is applied to connector P22 (5) and it is sent to IC201 (26) on (20) the other circuit function is same as recording mode.

CAPSTAN PHASE CONTROL (P.B)

In recording mode, the trapezoid is made up by V sync, but in playback mode, it is made up by reference 50 Hz signal which is applied to connector P22 (5) as shown in (20).
Also the sampling pulse, in recording mode, it is made up by capstan FG but in playback mode, it is made up by control pulse pin 2 of connector P23 as shown in (17).
Other circuit function is same as recording mode.

Servo Section Timing Chart

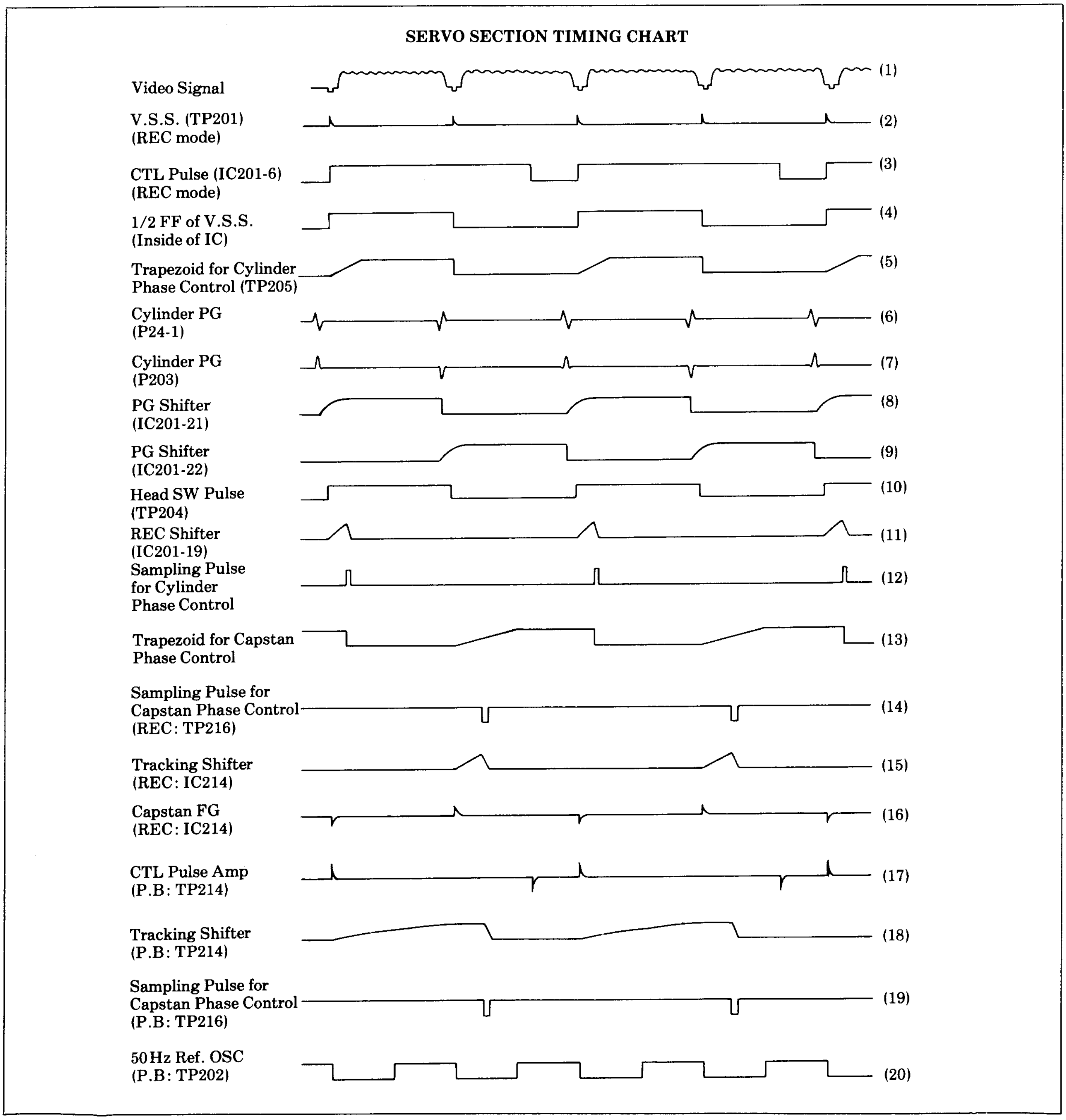

SERVO SECTION TIMING CHART
Video Signal
(1)
V.S.S. (TP201)
(REC mode)
(2)
CTL Pulse (IC201-6)
(REC mode)
(3)
1/2 FF of V.S.S.
(Inside of IC)
(4)
Trapezoid for Cylinder
Phase Control (TP205)
(5)
Cylinder PG
(P24-1)
(6)
Cylinder PG
(P203)
(7)
PG Shifter
(IC201-21)
(8)
PG Shifter
(IC201-22)
(9)
Head SW Pulse
(TP204)
(10)
REC Shifter
(IC201-19)
(11)
Sampling Pulse
for Cylinder
Phase Control
(12)
Trapezoid for Capstan
Phase Control
(13)
Sampling Pulse for
Capstan Phase Control
(REC: TP216)
(14)
Tracking Shifter
(REC: IC214)
(15)
Capstan FG
(REC: IC214)
(16)
CTL Pulse Amp
(P.B: TP214)
(17)
Tracking Shifter
(P.B: TP214)
(18)
Sampling Pulse for
Capstan Phase Control
(P.B: TP216)
(19)
50 Hz Ref. OSC
(P.B: TP202)
(20)

Fig. 57

Panasonic

MATSUSHITA ELECTRIC

Printed in Japan

ORDER NO. VRD-7807-300

Service Manual

Video Cassette Recorder

Vol. 2

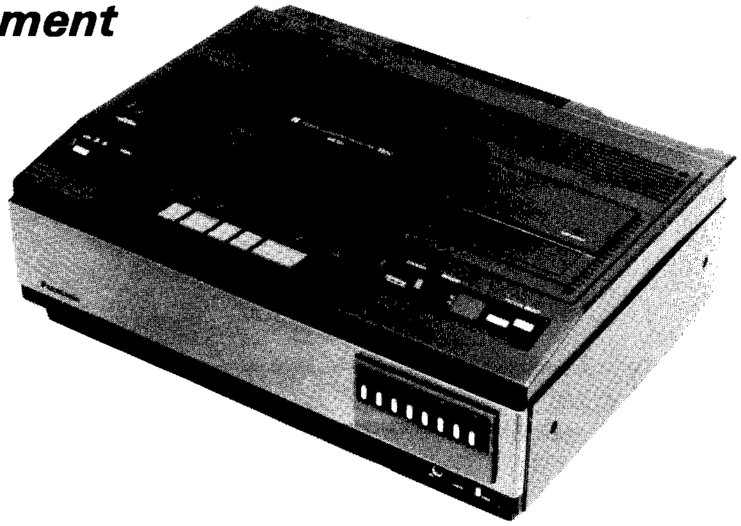
Panasonic VHS™

NV-8600 ·E ·B

Troubleshooting Guide

Electrical Adjustment Procedures

Mechanical Adjustment Procedures



SPECIFICATIONS

NV-8600-E (EUROPE)
NV-8600-B (ENGLAND)

Power Source:	220, 240 V AC, 50 Hz/60 Hz
Power Consumption:	Approx. 30 watts
Television System:	CCIR: 625 lines, 50 fields PAL colour signal
Video Recording System:	2 rotary heads, helical scanning system Luminance: FM azimuth recording Colour signal: converted subcarrier phase shift recording
Audio Track:	1 track
Tape Format:	Tape width 12.7 mm high density tape
Tape Speed:	23.39 mm/s
Record/Playback Time:	180 min. with NV-E180
FF/REW Time:	Less than 4.5 min. with NV-E180
Heads:	Video: 2 rotary heads Audio/Control: 1 stationary head Erase: 1 full track erase
Input Level:	Video: VIDEO IN jack 1.0 Vp-p, 75 ohm unbalanced Audio: MIN IN jack −70 dB, 600 ohm unbalanced LINE IN jack −20 dB, 100 kohm unbalanced
Output Level:	Video: VIDEO OUT jack 1.0 Vp-p, 75 ohm unbalanced Audio: LINE OUT jack −6 dB, 600 ohm unbalanced RF Modulated: UHF channel 45 (±2) 73 dB (open voltage), 75 ohm unbalanced
Weight:	17.0 kg
Dimensions:	485(W) × 368(D) × 176(H) mm
Accessories Supplied:	1 pc. Video cassette tape, NV-E120 1 pc. DIN-DIN coaxial cable, VJA0116 1 pc. Dust cover, VYC0028 1 pc. Remote pause control, NV-A181 Approx. 6 m
Optional Accessories:	Video cassette tape: NV-E180 Approx. 258 m, 180 min. NV-E120 Approx. 174 m, 120 min. NV-E60 Approx. 88 m, 60 min. Video camera, WV-460/E Microphone

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

Panasonic

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

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TROUBLESHOOTING GUIDE

A. Operational Troubles

Before you try to make adjustments or repairs, be sure to check the following items, because some trouble may be nothing more than mis-operation.

Item	Symptom	Cause	Countermeasure
A-1	No operation at all	A. Power switch is not pressed.	Press the power switch to turn the recorder ON.
		B. Timer switch on the built-in timer is set to the "ON" position.	Set the timer switch to OFF position.
A-2	No lock of operation buttons though you can press them.	A. Dew indication lamp is illuminating.	Wait till the lamp goes off.
		B. Power indication lamp is not illuminating.	Check the AC cord.
A-3	Auto stop during Rewind.	A. Tape counter memory switch is set to the "ON" position.	Set the switch to the "OFF" position.
		B. Tape is damaged.	Cut the damaged portion of tape and splice with a splicing tape (VFS1).
A-4	Record button is locked and cannot be pressed.	A. The tab on the cassette is broken.	Cover hole with cellophane tape.
A-5	Cannot watch an on-the-air TV program.	A. The TV/VTR selector on the top panel is set to the "VTR" position.	Set the selector to the "TV" position.
A-6	Cannot record an on-the air TV program.	A. The input selector on the front panel is set to the "Camera" position.	Set the selector to the "TV" position.
		B. Antenna cable is poorly connected.	Connect it correctly.
A-7	No sound during an on-the-air TV program recording.	A. Microphone is connected to the Mic jack on the front panel.	Disconnect the microphone.
A-8	No playback image.	A. The TV/VTR selector is set to the "TV" position.	Set the selector to the "VTR" position.
A-9	Noisy picture during playback.	A. The tracking control on the top panel is mis-adjusted.	Adjust the control correctly.

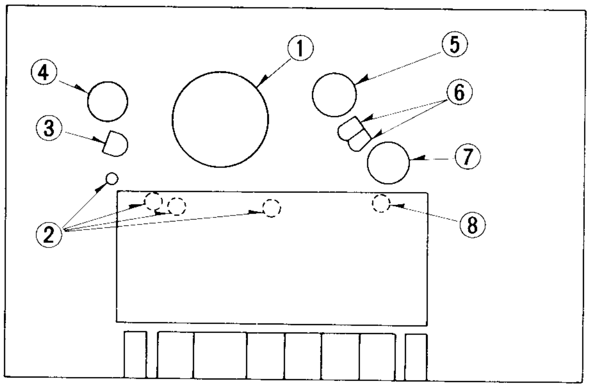
B. Cleaning

The following symptoms are usually corrected by cleaning the head(s) as stated below. If the symptom remains after cleaning, make mechanical adjustments according to the mechanical adjustment procedures.

Item	Symptom	Cause	Countermeasure
B-1	Snow noise on a playback image.	Video head clogging.	Clean the video heads with a head cleaning stick (part No. VFK27)
B-2	Periodic noise on a playback image.	Control head clogging.	Clean the control head with a head cleaning stick (part No. VFK27).
B-3	Little or no sound.	Audio head clogging.	Clean the audio head with a head cleaning stick (part no. VFK27)

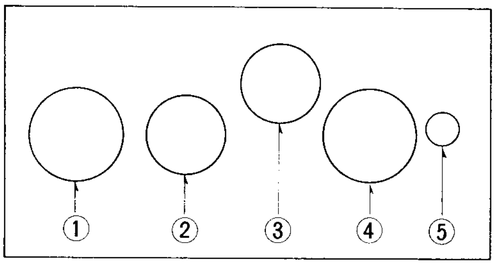
Item	Symptom	Cause	Countermeasure
B-4	Unstable tape transportation.	Parts need cleaning.	Clean the following parts.

B-4-1. TOP VIEW



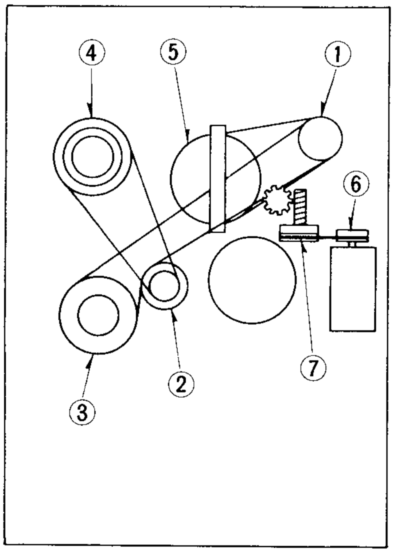
① Cylinder.
② Posts
③ Full Erase Head
④ Supply Inertia Roller
⑤ Takeup Inertia Roller
⑥ Audio/Control and Audio Erase Heads
⑦ Pressure Roller
⑧ Capstan Shaft

B-4-2. UNDER THE CASSETTE COMPARTMENT



① Supply Reel
② Rewind Roller
③ Fast Forward Idler
④ Takeup Reel
⑤ Play Roller

B-4-3. BOTTOM VIEW



① Capstan Motor Pulley
② Intermediate Pulley
③ Main Pulley
④ Play Pulley
⑤ Capstan Flywheel
⑥ Loading Motor Pulley
⑦ Pinion Gear Pulley

C. Technical Troubleshooting Guide (Circuitry)

Item	Symptom	Troubleshooting
C-1	TRANSPORT CIRCUIT Operation buttons are locked and impossible to press.	Check Q614→615→618 └→D619→Q616→617 →D614→Q613→D611→Q612→D618 →Q611 →Q634 →Q626→627→628 →Q601→Q602
C-2	TRANSPORT CIRCUIT Abnormal Loading/Unloading	Check Q604→605→607 →Q610→609→608–606 →Q611→Counter Belt
C-3	TRANSPORT CIRCUIT Pressure Roller Solenoid doesn't work.	Check Q612→D612→611→613→624→623 →D625→D626→625 →Q621→622 →Q620→619
C-4	CYLINDER SERVO Excessive horizontal sway or no horizontal synchronization on a TV monitor.	A. Check TP206 (Sampling Pulse) & TP205 (Trapezoidal Wave)with a dual trace oscilloscope. If the sampling pulses don't lock on the trapezoidal wave, adjust R223 (CYLINDER FREE RUN) at first. (See electrical adjustment procedures) When you adjust R223, if the pulse don't lock on the trapezoid, check the Cylinder Servo circuit as follows. Check IC201(8)→IC201(14)→D207→Q213→Q212→D213→D212 B. If the sampling pulses don't appear at TP206, check the circuit as follows. Check TP204→IC201(24)(23)→Q211→Connector P24(1). C. If the trapezoidal wave doesn't appear at TP205, check the circuit as follows. REC Check IC201(25)→Q201→Connector P22(3) P.B IC201(26)→Connector P22(5)→Connector P32(2)→ IC805(5) (Chrominance Board)
C-5	CAPSTAN SERVO Periodic noise appears on a TV monitor.	A. Check TP216 (Sampling Pulse) & TP215 (Trapezoidal Wave) with a dual trace oscilloscope. If the sampling pulses don't lock on the trapezoidal wave, adjust R2116 (CAPSTAN FREE RUN) at first (See electrical adjustment procedures) When you adjust R2116, if the pulses don't lock on the trapezoid, check the Capstan Servo circuit as follows. Check Connector P21(2)→IC203(16)→IC203(7)→Q226→D224→ →Q227→D225→Q228

Item	Symptom	Troubleshooting
		B. If the sampling pulse don't appear at TP216, check the circuit as follows. REC Check IC203(15)→IC215(3)→IC202(8)→IC206(6)→Q215→IC203(5) →IC203(16)→Connector P21(2) P.B →IC203(15)→IC201(2)→IC201(6)→Connector P23 (2). C. If the trapezoidal wave doesn't appear at TP215 , check the circuit as follows. REC Check→IC203(15)→IC201(18)→IC201(25)→Q201→ →Connector P22 (3) P.B →IC203(15)→IC201(18)→IC201(26)→Connector P22(5)
C-6	VIDEO PROCESS Poor image in the playback mode. (Play back a recorded tape).	A. IC501(10)→P52(9)→P35(4)→Q323→FL304→Q320→Q319→JD(1) →IC801(13)→IC801(7)→FL802→Q807→Q806→DL801→Q805→ →* →Q804→IC801(15) →*** * IC801(5)→FL803→IC802(12)→IC802(14)→IC805(4)→IC805(6) →** →IC802(17) ** IC802(15)→IC803(14) *** Q814→IC803(6)→IC803(8)→Q816→Q818→IC801(6)→IC801(10) (Colour) B. P35-4→Q323→Q322→Q321→IC302(9)→IC302(16)→Q316→FL305 →IC302(7) (B/W) (Colour) →Q317→IC302(22)→IC302(24)→IC302(25)→IC302(20)→IC302(27) (B/W) →IC302(2)→Q314→Q313 →Q315
C-7	VIDEO PROCESS Pre-recorded tape playback is OK but poor image if recorded then the portion is played back.	P31-1→FL301→IC301(1)→IC301(24)→IC302(4)→IC302(2)→Q315 →FL302← (Only Colour) * * IC301(22)→IC301(19)→IC301(18)→Q301→IC301(16)→IC301(9) →Q307 (Colour) →Q308 (B/W) P31-1→Q318→JD-1→IC801(13)→IC801(7)→FL801→Q802 →* →IC801(9)→IC801(10) * IC801(5)→FL803→IC802(12)→IC802(14)→IC805(4)→IC805(6) →** →IC802(17) ** IC802(15)→IC803(14)

ELECTRICAL ADJUSTMENT PROCEDURES

This section provides complete electrical adjustment procedures which may be required for electronic circuits of PAL VHS video cassette recorder.

1. Test Equipment

To make adjustments completely, following equipment is required.

1. V.T.V.M. (Vacuum Tube Volt Meter)
   Voltage Range: 0.001—50V
2. Dual-trace Oscilloscope
   Voltage Range: 0.005—50V/div.
   Frequency Range: DC—10MHz
   Probes: 10 : 1 and 1 : 1
3. Frequency Counter
   Frequency Range: 0—10MHz
4. Signal Generator
   Sinewave: 0—10MHz
5. Sweep Generator
   Frequency Range: 0—10MHz
6. Colour Receiver or Monitor TV
7. Plastic Tip Driver

2. Adjustment Procedures

This adjustment procedures consist of the following sections.

1. Power Supply and Transport Control Section.
2. Servo Control Section.
3. Audio Section.
4. Video Section.

2-1. POWER SUPPLY AND TRANSPORT CONTROL SECTION

Before adjusting the Power Supply circuit, be sure check the AC input voltage 220V (NV-8600-E) or 240V (NV-8600-B). Connect a video signal to video input on the rear panel or tune in a local on-air programme, insert a cassette tape, lower the cassette compartment and make a recording. If no power, check the timer switch on the built-in timer first (If the switch is set to "ON" portion, no power is supplied to the unit, even through the power switch is pressed ON).

If no power or no tape movement, regardless of time switch position check the three fuses on the Power Supply circuit board VEP0160A/B.

2-1-1. Transport +12V Power Supply Adjustment

Test Point: TP612
Adjustment: R693 (+12V ADJ).

1. Connect the VTVM to TP612 on the Transport Control circuit board (VEP0669E1).
2. Place the unit in Stop mode.
3. Adjust R693 (+12V ADJ.) for 12.0±0.1V.

2-1-2. Supply Photo Sensor Confirmation

1. Place the unit in Fast Forward mode. Let the tape run till its end.
2. Make sure that when the translucent tape appears in front of the cassette, the Fast Forward button reaches to its normal position.
3. If it does not reach to its normal position, short-circuit CP-1 on the Transport Control circuit board (VEP0669E1).
4. And re-confirm the above item 2.

2-1-3. Take-up Photo Sensor Confirmation

1. Place the unit in Rewind mode. Let the tape run till its beginning.
2. Make sure that when the translucent tape appears in front of the cassette, the Rewind button reaches to its normal position.
3. If it does not reach to its normal position, short-circuit CP-2 on the Transport Control circuit board (VEP0669E1).
4. And re-confirm the above item 2.

2-2. SERVO CONTROL SECTION

Servo Control adjustment procedures consist of two parts.

A. Adjustment in Playback mode.
B. Adjustment in Record mode.

A. ADJUSTMENTS IN PLAYBACK MODE.

2-2-1. P.G. Head Output Confirmation

Test Point: TP203

1. Connect the oscilloscope to TP203 on the Servo Control circuit board (VEP0287E).
2. Playback the CCIR monoscope section of recorded reference tape.
3. Confirm that the level (Vp) is 1.8Vo-p or more as shown in Fig. 1.

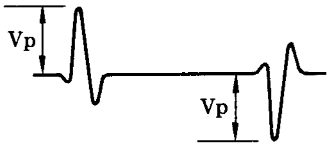


Fig. 1-a

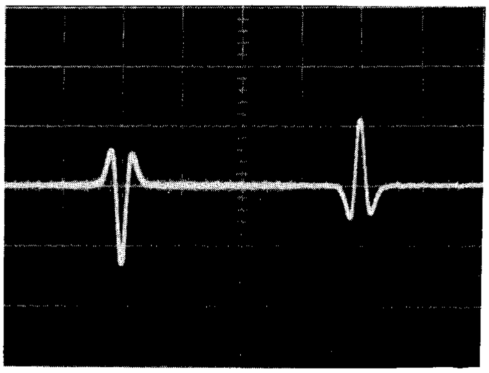


Fig. 1-b

2-2-2. Switching Flip-Flop Duty Cycle Adjustment

Test Points: TP505, TP506
Adjustments: R209 (CY. PG SHIFTER ADJ.)
R211 (CY. PG SHIFTER ADJ.)

1. Connect the jumper wire between TP501 and TP502 on the Rec. & Head Amp. circuit board (VEP0536A1).
2. Connect the oscilloscope CH1 to TP505 and CH2 to TP506 on the same circuit board. Use TP505 for trigger of oscilloscope.
3. Playback the CCIR monoscope section of recorded reference tape and set the oscilloscope to the CHOP mode. Then expand the switching portion of the envelope.

4. Now adjust R211 (CY. PG SHIFTER ADJ.) on the Servo Control circuit board (VEP0287E) to place the rising edge of the switching pulse in the center of the overlapped of RF envelope.
5. Then adjust R209 (CY. PG SHIFTER ADJ.) on the Servo Control circuit board to place the falling edge of the switching pulse in the center of the overlapped of RF envelope.
6. Remove the jumper wire.

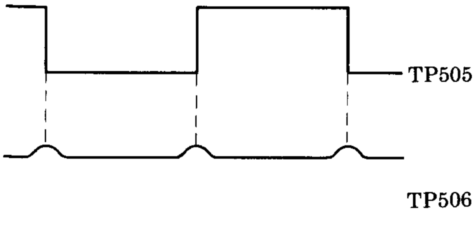


Fig. 2-a

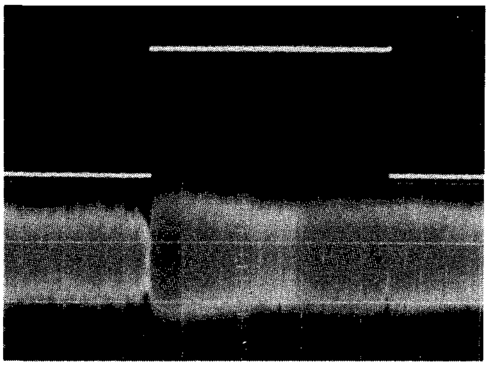


Fig. 2-b

2-2-3. Control Head Output Confirmation

Test Point: TP208

1. Connect the oscilloscope to TP208 on the Servo Control circuit board (VEP0287E).
2. Playback the CCIR monoscope section of recorded reference tape.
3. Make sure that the level (Vc) of positive pulses is more than 1.0 V as shown in Fig. 3.

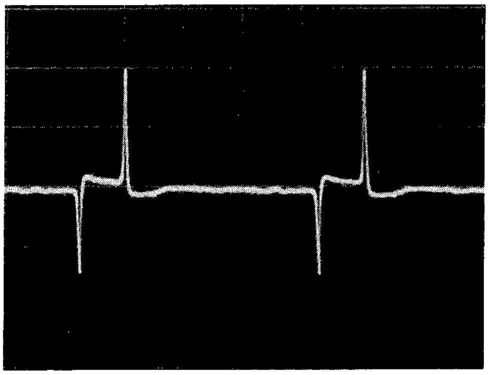


Fig. 3-a

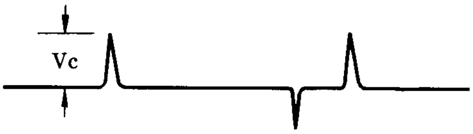


Fig. 3-b

2-2-4. Tracking Fix Adjustment

Test Points: TP204, TP214

Adjustment: R270 (TRACKING FIX ADJ.)

1. Set the Tracking Control on the top panel to the center portion.
2. Connect the oscilloscope CH1 to TP204 and CH2 to TP215 on the Servo Control circuit board (VEP0287E). Use TP204 for trigger of the oscilloscope.
3. Playback the recorded reference tape.
4. During playback, adjust R270 (TRACKING FIX ADJ) so that the phase relationship between TP204 and TP214 becomes as shown in Fig. 4.

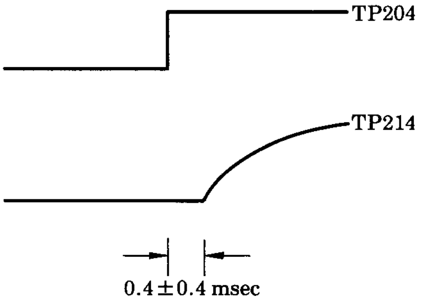


Fig. 4

B. ADJUSTMENTS IN RECORD MODE.

2-2-5. DD Oscillation Level Adjustment

Test Point: TP209

Adjustment: R262 (OSC ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP209 on the Servo Control circuit board (VEP0287E).

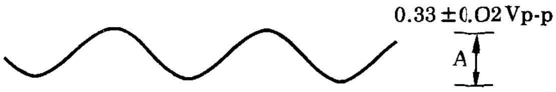


Fig. 5-a

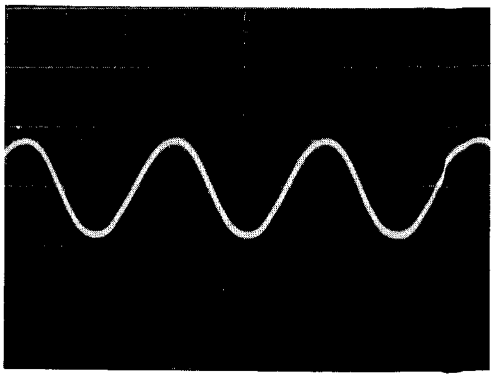


Fig. 5-b

3. Insert a video cassette and place the unit in Rec Play mode
4. Adjust R262 (OSC ADJ) on the same circuit board so that the "A" portion of the waveform is 0.33 ± 0.02 Vp-p.

2-2-6. Capstan FG Output Confirmation

Test Point: TP213

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP213 on the Servo Control circuit board (VEP0287E).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Make sure that the level becomes 200—500 mV.

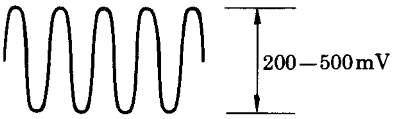


Fig. 6-a

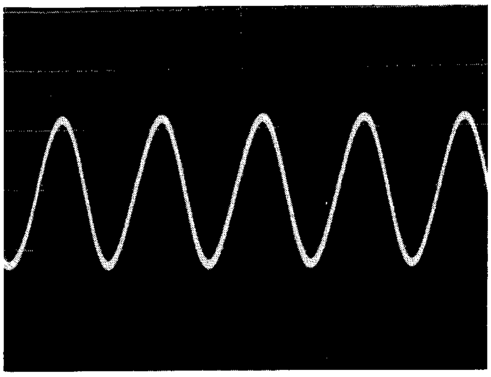


Fig. 6-b

2-2-7. Control Duty Adjustment

Test Point: TP207

Adjustment: R204 (CTL DUTY ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP207 on the Servo Control circuit board (VEP0287E).
3. Insert a video cassette and place the unit in Rec play mode.
4. Adjust R204 (CTL DUTY ADJ) so that the waveform at TP207 becomes as shown in Fig. 7.

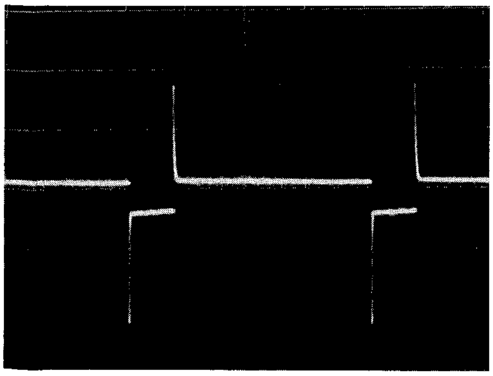


Fig. 7-a

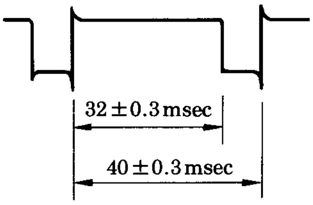


Fig. 7-b

2-2-8. Cylinder Servo Sampling Gate Adjustment

Test Points: TP204, TP205, TP206

Adjustment: R223 (CY. FREE RUN ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope CH1 to TP205 and CH2 to TP204 on the Servo Control circuit board (VEP0287E).
   Set the oscilloscope to CHOP mode.
3. Insert a video cassette and place the unit in Rec Play mode.
4. Pre-adjust R223 (CY. FREE RUN ADJ) on the same circuit board so that the two waveforms are locked.

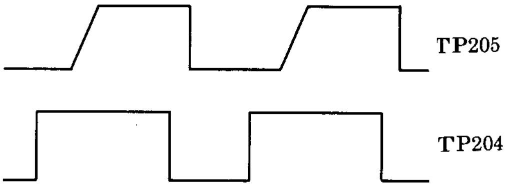


Fig. 8

5. Connect the VTVM to TP206 on the same circuit board.
6. Adjust R223 (CY. FREE RUN ADJ) so that the voltage becomes 5 ± 0.2 V.

2-2-9. Capstan Servo Sampling Gate Adjustment

Test Points: TP215, TP216, TP217

Adjustment: R2116 (CAP FREE RUN ADJ)

1. Supply a video signal to Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope CH1 to TP215 and CH2 to TP216 on the Servo Control circuit board (VEP0287E).
   Set the oscilloscope to ADD mode.
3. Insert a video cassette and place the unit in Rec Play mode.
4. Pre-adjust R2116 (CAP FREE RUN ADJ) on the same circuit board so that the sampling pulses are locked on the rising slope of trapezoidal waveform.
5. Connect the VTVM to TP217 on the same circuit board.
6. Adjust R2116 (CAP FREE RUN ADJ) so that the voltage becomes 5 ± 0.2 V.

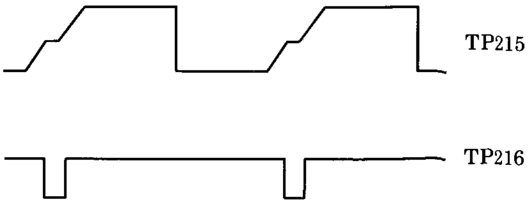


Fig. 9-a

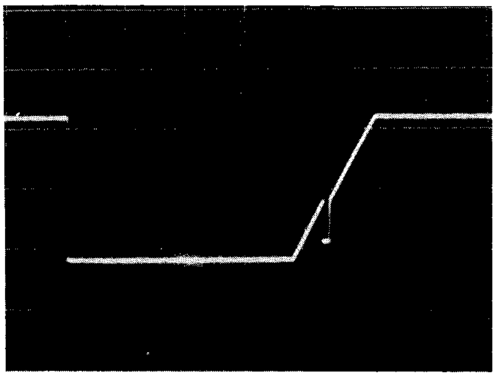


Fig. 9-b

2-2-10. Head Switching Position Adjustment

Test Points: TP204, TP301

Adjustment: R213 (REC SHIFTER ADJ)

1. Supply a video signal to the Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope CH1 to TP204 on the Servo Control circuit board (VEP0287E) and CH2 to TP301 on the Luminance Process circuit board (VEP0374A). Set the oscilloscope to CHOP mode.
3. Insert a video cassette and place the unit in Rec Play mode.
4. Also set the oscilloscope to the Delay mode, and expand the vertical interval of the signal from TP301.
5. While the recording is taking place adjust R213 (REC SHIFTER ADJ) so that the recording head switching point is 6±1H before the start of vertical sync as shown in Fig. 10.
6. Change the slope of oscilloscope from "+" to "−" and make sure that the other switching point is also 6±1H before the beginning of vertical sync. If more or less than 6±1H, re-adjust the switching Flip-Flop Duty Cycle.

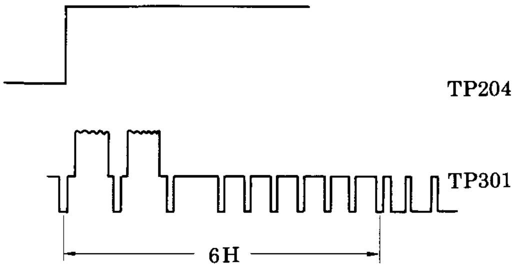


Fig. 10-a

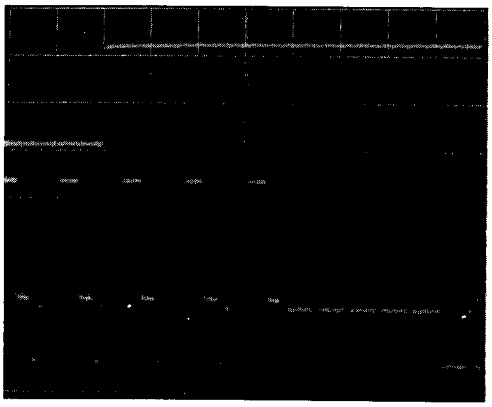


Fig. 10-b

2-3. AUDIO SECTION

Audio adjustment procedures consist of two parts.

A. Adjustment in the Record mode.

B. Adjustment in the Playback mode.

A. ADJUSTMENTS IN THE RECORD MODE.

2-3-1. Bias Leak Confirmation

Test Point: TP402

1. Supply a sinewave signal (1kHz, 0.6Vp-p) to the Audio Input on the rear panel and set the Input Selector on the front panel to CAMERA position.
2. Connect the oscilloscope to TP402 on the Audio circuit board (VEP0442E).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Make sure that the bias leak is 300mV or less as shown in Fig. 11.

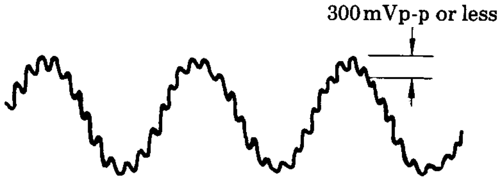


Fig. 11

2-3-2. Bias Current Adjustment

Test Point: Audio Head Portion

Adjustment: C434 (BIAS ADJ)

1. Do not supply any audio signal to the Audio Input on the rear panel. Set the Input Selector on the front panel to CAMERA position.
2. Insert a video cassette and place the unit in Rec Play mode.
3. Connect the VTVM as shown in Fig. 12.
4. While the recording is taking place, adjust C434 (BIAS ADJ) so that the indication of VTVM is 1.1±0.05mVrms.

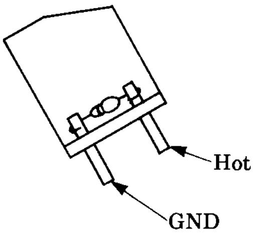


Fig. 12

2-3-3. Bias Oscillator Confirmation

Test Point: Both ends of Full Erase Head

1. Do not supply any audio signal to the Audio Input on the rear panel. Set the Input Selector on the front panel to CAMERA position.
2. Insert a video cassette and place the unit in Rec Play mode.
3. Connect the oscilloscope to the both ends of full erase head, and make sure that the output (V_F) becomes 40Vp-p or more.
4. Also, connect the frequency counter to the both ends of full erase head, and make sure that the indication of frequency counter becomes 67±5kHz.

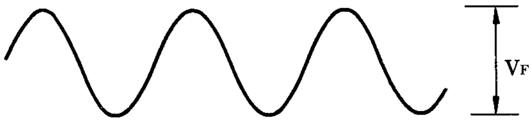


Fig. 13

2-3-4. AGC Confirmation

Test Point: TP401

1. Supply a sinewave signal (1kHz, −10dB) to the Audio Input on the rear panel. Set the Input Selector on the front panel to CAMERA position.
2. Connect the oscilloscope to TP401 on the Audio circuit board (VEP0442E).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Make sure that the audio level is 1.5±0.2Vp-p.

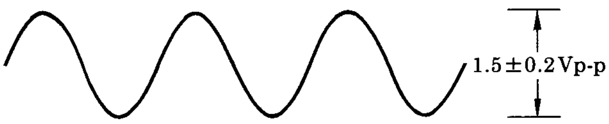


Fig. 14

B. ADJUSTMENTS IN THE PLAYBACK MODE

2-3-5. Playback Equalizer Adjustment

Test Point: TP401
Adjustment: R404 (P.B. EQ ADJ)

1. Supply sinewave signals (1kHz and 5kHz, 0.06Vp-p) to the Audio Input on the rear panel.
2. Insert a video cassette and record the 1kHz signal at first then the 5kHz signal next.
3. Connect the VTVM to TP401 on the Audio circuit board (VEP0442E).
4. Playback the portion just recorded.
5. Adjust R404 (P.B. EQ ADJ) on the same circuit board so that the 1kHz and 5kHz outputs are balanced.

2-3-6. Playback Gain Adjustment

Test Point: TP401
Adjustment: R405 (P.B. GAIN ADJ)

1. Supply a sinewave signal (1kHz, 0.6Vp-p) to the Audio Input on the rear panel.
2. Connect the VTVM to TP401 on the Audio circuit board (VEP0442E).
3. Insert a video cassette and make a recording. While the recording is taking place, read the voltage (V_1).
4. Playback the portion just recorded. During playback, adjust R405 (P.B. GAIN ADJ) on the same circuit board so that the voltage (V_2) is same as in the Record mode.

2-4. VIDEO SECTION

2-4-1. Head Amp Peak Frequency Adjustment

Test Point: TP506
Adjustments: C514, C516 (PEAK ADJ)
R531, R536 (Q ADJ)

1. Set the output of sweep generator to 100mV at no load, and after that set it to 10mV (−20dB).
2. Supply the above signal to TP507 on the Rec & Head Amp circuit board (VEP0536A1).
3. Connect the oscilloscope to TP506 on the same circuit board.
4. Cover the take-up photo transistor with a piece of black tape, and place the unit in Playback mode with no tape in the unit.
5. Adjust R531 (CH2 Q ADJ) and R536 (CH1 Q ADJ) so that the level at 5MHz becomes 5 times bigger than the level at 2MHz.
6. Also adjust C514 (CH2 PEAK ADJ) and C516 (CH1 PEAK ADJ) so that the peaks on the oscilloscope becomes 4.9±0.1MHz.

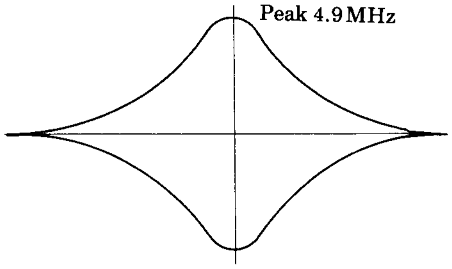


Fig. 15

2-4-2. Rec Amp Frequency Response Confirmation

Test Points: TP502, TP504

1. Supply the CCIR monoscope pattern signal to Video Input on the rear panel from sweep generator.
2. Connect a jumper wire between TP306 and ground.
3. Connect the sweep generator to TP307. Put the marker on 1MHz, 2MHz and 3.8MHz.
4. Connect the oscilloscope between TP504 (HOT) and TP502 (GND).
5. Set the output of sweep generator to 110mVpp at 3.8MHz portion.
6. Make sure that the output waveform becomes as shown in Fig. 16.
7. Place the unit in Rec Play mode and make a recording a few minutes.
8. Remove the jumper wires.

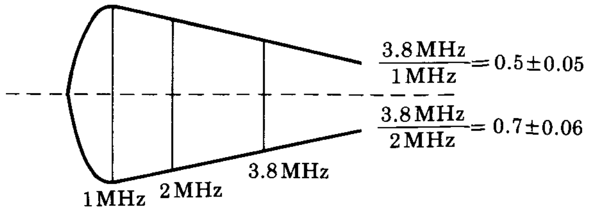

$\frac{3.8MHz}{1MHz} = 0.5\pm0.05$
$\frac{3.8MHz}{2MHz} = 0.7\pm0.06$
3.8MHz
1MHz
2MHz

Fig. 16

2-4-3. Head Amp Frequency Response MIX Balance Adjustment

Test Point: TP506
Adjustments: R531 (CH2 Q ADJ)
R533 (MIX ADJ)
R536 (CH1 Q ADJ)

1. Set R533 (MIX ADJ) to center portion.
2. Connect the oscilloscope to TP506 on the Head Amp circuit board (VEP0536A1).
3. Playback the portion just recorded in item 8 of 2-4-2 (Rec Amp Frequency Response Confirmation).
4. Adjust R536 (CH1 Q ADJ) so that the level of peak frequency is 1.5±0.1 times bigger than level of 2MHz as shown in Fig. 17, by taking aim at CH2.
5. Also, adjust R531 (CH2 Q ADJ) so that the level of peak frequency is 1.5±0.1 times bigger than level of 2MHz by taking aim at CH2.
6. After above adjustments, adjust R533 (MIX ADJ) so that the level of peak frequency becomes equal.

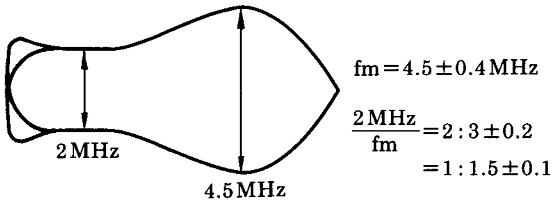


Fig. 17

2-4-4. Sync Tip Frequency and Deviation Adjustments

Test Points: TP306, TP312
Adjustments: C320 (SYNC FREQ ADJ)
R316 (DEV ADJ)

Before proceduring the following adjustments, several adjustment connections are required.

a. Connect a jumper wire between pins 3 and 4 of connector J3 on Luminance Process circuit board (VEP0374A) in order to keep the modulator and demodulator turned on at all time.
b. Connect a 1KΩ resistor and 0.01μF (or 0.047μF) capacitor, in series between TP306 and pin 10 of IC302 on the same circuit board. This will feed the modulator output to the demodulator input.
c. Connect a signal generator (sinewave) to TP306 through a 1KΩ resistor and a 0.01μF (or 0.047μF) capacitor.

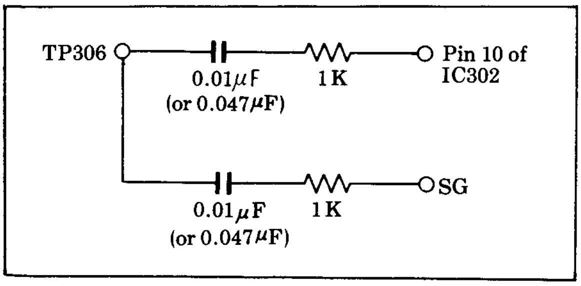


Fig. 18-a

1. Prior to this adjustment, turn R329 (WHITE CLIP ADJ) fully clockwise and R332 (DARK CLIP ADJ) fully clockwise.
2. Supply a B/W stair-step signal to Video Input on the rear panel.
3. Connect the oscilloscope to TP312 on the same circuit board.
4. Set the frequency of signal generator to 3.8MHz.
5. Insert a video cassette and place the unit in Rec Play mode.
6. Adjust C320 (SYNC FREQ ADJ) for minimum carrier leakage at sync tips.

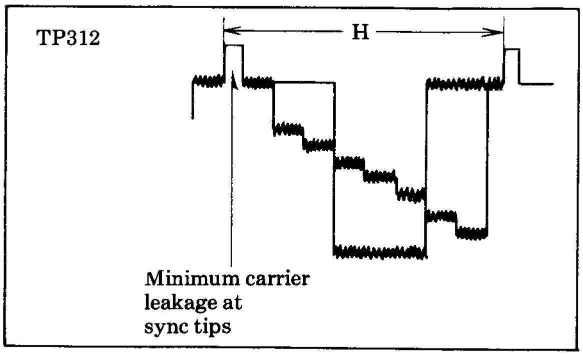


Fig. 18-b

7. Change the frequency of the signal generator from 3.8MHz to 4.8MHz.
8. Adjust R316 (DEV ADJ) for minimum carrier leakage at peak white.
9. Remove the jumpers.

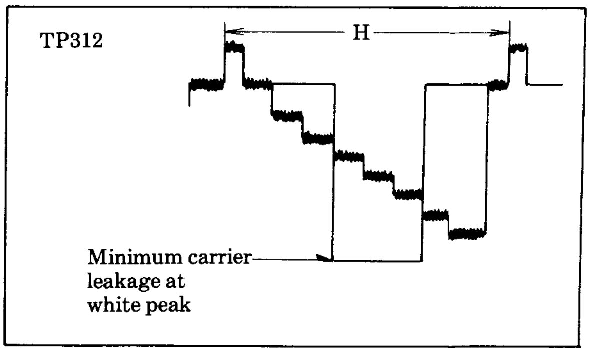


Fig. 18-c

2-4-5. White and Dark Clip Adjustments

Test Point: TP305
Adjustments: R329 (WHITE CLIP ADJ)
R332 (DARK CLIP ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel.
2. Connect the oscilloscope to TP305 on the Luminance Process circuit board (VEP0374A).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Adjust R329 (WHITE CLIP ADJ) and R332 (DARK CLIP ADJ) on the same circuit board so that the over shoot and undershoot becomes as shown in Fig. 19.

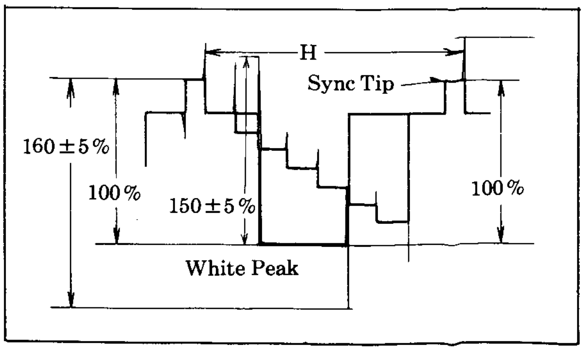


Fig. 19-a

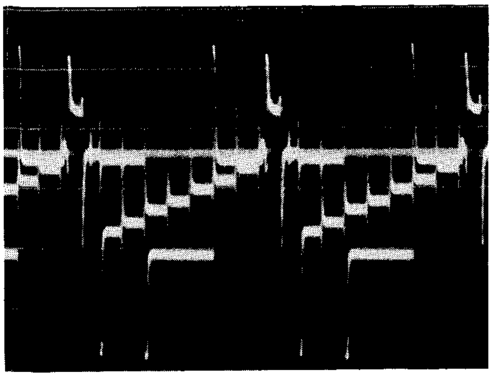


Fig. 19-b

2-4-6. 2.0μsec Pulse Adjustment

Test Points: TP807, TP815

Adjustments: R813 (AFC ADJ)
R899 (2.0μsec PULSE ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope CH1 to TP815 and CH2 to TP807 on the Colour Process circuit board (VEP0846A).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Adjust R899 (2.0μsec PULSE ADJ) so that the "t" portion of 2.0μsec pulse is 2.0 ±0.3μsec as shown in Fig. 20.
5. Also, adjust R813 (AFC ADJ) so that the "T" portion on relationship between TP807 and TP815 waveform becomes 5.5±0.5μsec.

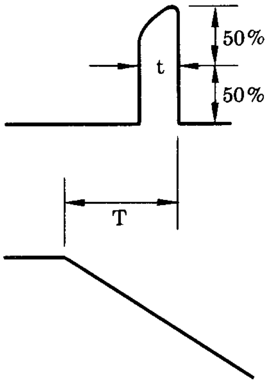


Fig. 20-a

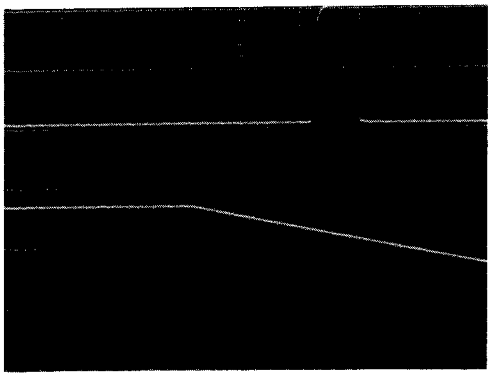


Fig. 20-b

2-4-7. APC Oscillation Frequency Confirmation

Test Point: TP812

Adjustment: R892 (APC ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel or tune in local on-air TV programme.
2. Connect the frequency counter to TP812 on the Colour Process circuit board (VEP0846A).
3. Insert a video cassette and place the unit in Rec Play mode.
4. Adjust R892 (APC ADJ) so that the indication of frequency counter is 4.435572MHz ± 10Hz.

2-4-8. 4.43MHz Crystal Oscillator Adjustment

Test Point: TP810

Adjustment: C821 (4.43MHz OSC ADJ).

1. Do not supply any video signal to the Video Input on the rear panel.
2. Connect the frequency counter to TP810 on the Colour Process circuit board (VEP0846A).
3. Place the unit in Stop mode.
4. Adjust C821 (4.43MHz OSC ADJ) so that the indication of frequency counter is 4.433619MHz ±5Hz.

2-4-9. Rec Colour Killer Confirmation

Test Point: TP809

Adjustment: R357 (REC KILL)

1. Supply a colour bar signal to the Video Input on the rear panel.
2. Connect the oscilloscope to TP809 on the Colour Process circuit board (VEP0846A).
3. Connect a jumper wire between TP311 and ground through 47Ω resistor.
4. Insert a video cassette and place the unit in Rec Play mode.
5. Make sure that the DC level at TP809 is High level.
6. Supply a CCIR monoscope signal to the Video Input on the rear panel.
7. Remove the 47Ω resistor.
8. Make sure that the DC level at TP809 is Low level.

2-4-10. Recording Current Adjustment

Test Points: TP502, TP504

Adjustments: R334 (REC CUR ADJ)
R810 (REC CHROMA LEVEL ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel.
2. Fully turn R334 (REC CUR ADJ) counterclockwise.
3. Connect the oscilloscope between TP504 (HOT) and TP502 (GND).
4. Adjust R810 (REC CHROMA LEVEL ADJ) so that the chroma recording current is 28mVp-p.
5. Adjust R334 (REC CUR ADJ) so that the V. sync portion on envelope at TP504 becomes 130mVp-p.

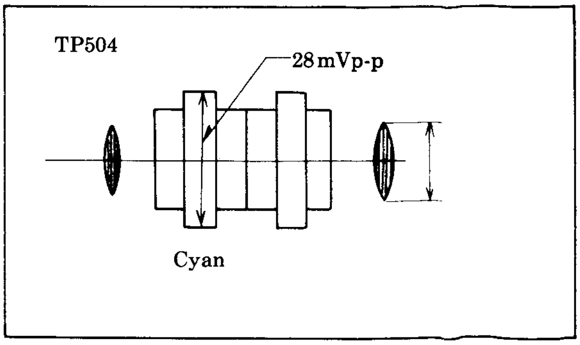


Fig. 21-a Chroma Record Current

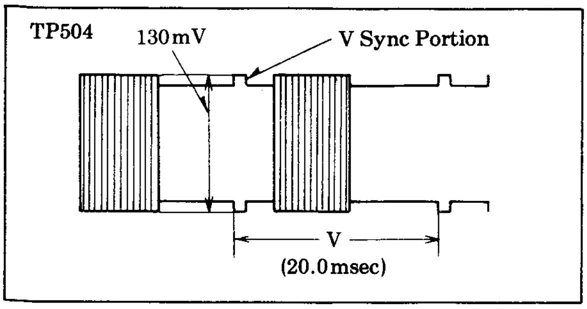


Fig. 21-b Luminance Record Current

2-4-11. Dropout Detector Input Level Adjustment

Test Point: TP308
Adjustment: R3137 (RF LEVEL ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel or tune in local on-air TV programme.
2. Connect the oscilloscope to TP308 on the Luminance Process circuit board (VEP0374A).
3. Insert a video cassette and make a recording for a few minutes.
4. Playback the portion just recorded.
5. Adjust R3137 (RF LEVEL ADJ) so that the level becomes 600mVp-p as shown in Fig. 22

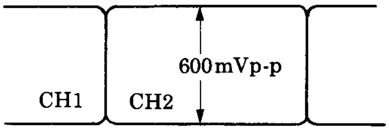


Fig. 22

2-4-12. Limiter Balance Adjustment

Test Point: TP312
Adjustment: R3110 (LIM BAL ADJ)

1. Supply a colour bar signal to Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP312 on the Luminance Process circuit board (VEP0374A).
3. Insert a video cassette and make a recording for a few minutes.
4. Playback the portion just recorded.
5. During playback, adjust R3110 (LIM BAL ADJ) so that the carrier leakage (3.8MHz component) becomes minimum, 30mVp-p or less.

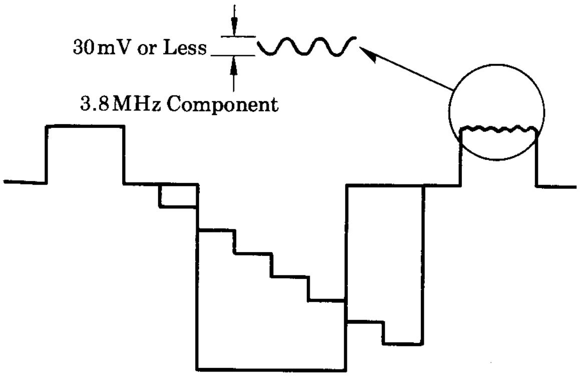


Fig. 23

2-4-13. Video/Chroma Level Adjustment

Test Point: TP314
Adjustments: R383 (VIDEO LEVEL ADJ)
R806 (P.B. CHROMA LEVEL ADJ)

1. Supply a colour bar signal to the Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP314 on the Luminance Process circuit board (VEP0374A).
3. Insert a video, cassette and make a recording for a few minutes.
4. Playback the portion just recorded.
5. During playback, adjust R383 (VIDEO LEVEL ADJ) so that the video level becomes 2.0±0.05Vp-p.
6. Then, adjust R806 (P.B. CHROMA LEVEL ADJ) on the Colour Process circuit board (VEP0846A) so that the level of cyan portion becomes 1.1±0.05Vp-p as shown in Fig. 24.

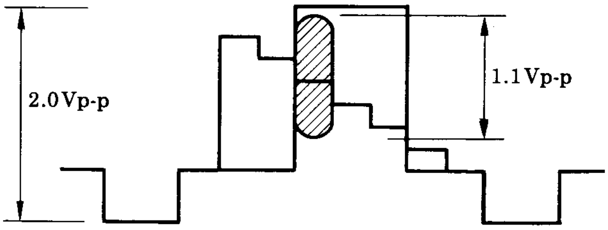


Fig. 24

2-4-13. E-E Level Adjustment

Test Point: TP314
Adjustment: R307 (E-E LEVEL ADJ)

1. Supply a colour bar signal to Video Input on the rear panel or tune in a local on-air TV programme.
2. Connect the oscilloscope to TP314 on the Luminance Process circuit board (VEP0374A).
3. Place the unit in Stop mode.
4. Adjust R307 (E-E LEVEL ADJ) so that the video level becomes 2.0±0.1Vp-p.

MECHANICAL ADJUSTMENT PROCEDURES

Disassembly Method

1. DISASSEMBLY FLOW CHART

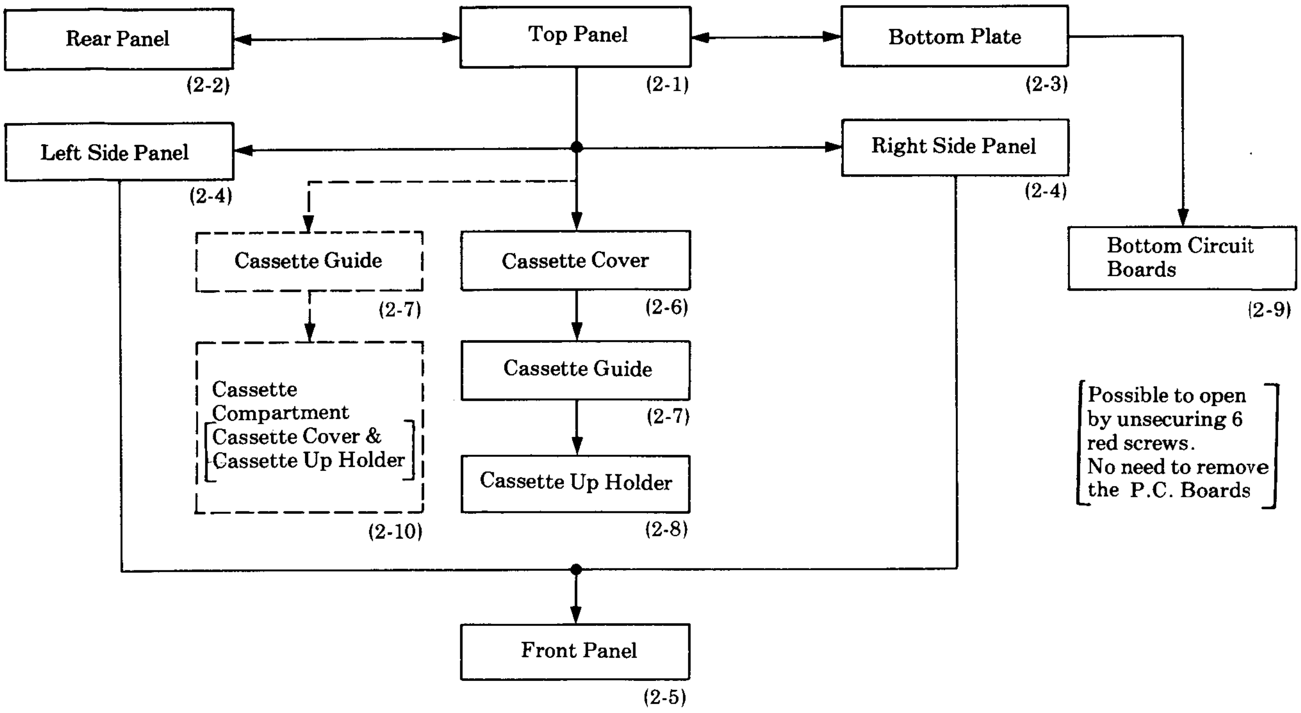

Rear Panel
(2-2)
Top Panel
(2-1)
Bottom Plate
(2-3)
Left Side Panel
(2-4)
Right Side Panel
(2-4)
Cassette Guide
(2-7)
Cassette Cover
(2-6)
Bottom Circuit Boards
(2-9)
Cassette Compartment
Cassette Cover & Cassette Up Holder
(2-10)
Cassette Guide
(2-7)
Cassette Up Holder
(2-8)
Possible to open by unsecuring 6 red screws. No need to remove the P.C. Boards
Front Panel
(2-5)

Fig. 1

2. DETAILED DISASSEMBLY METHOD

2-1. Removal of the Top Panel

1. Pull off the Tracking Control Knob.
2. Unscrew the 5 screws (A) and remove the Top Panel.

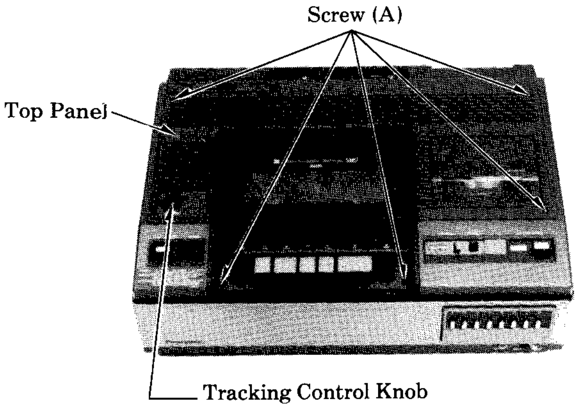

Screw (A)
Top Panel
Tracking Control Knob

Fig. 2

2-2. Removal of the Rear Panel

Unscrew the 5 screws (B) and remove the Rear Panel.

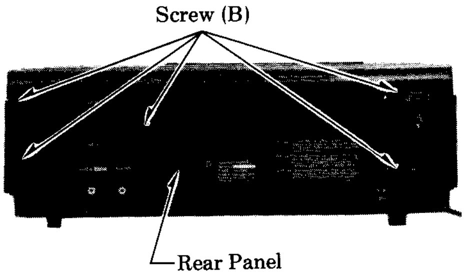

Screw (B)
Rear Panel

Fig. 3

2-3. Removal of the Bottom Plate

Unscrew the 6 screws (C) and remove the Bottom Plate.

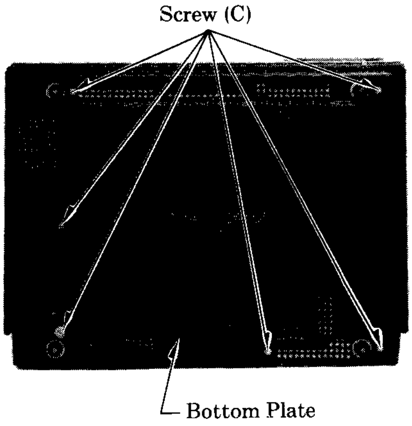

Screw (C)
Bottom Plate

Fig. 4

2-4. Removal of the Side Panels

Unscrew the 4 screws (D) on both sides and remove the Side Panels.

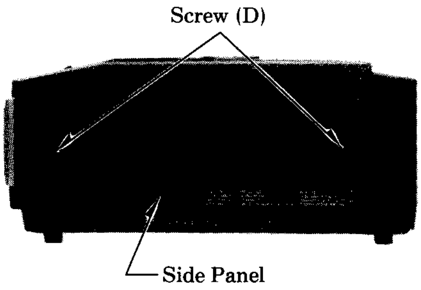

Screw (D)
Side Panel

Fig. 5

2-5. Removal of the Front Panel

1. Unscrew the 4 screws (E), loosen the 2 screws (F) and remove the Front Panel.
2. And disconnect the connector P705 on the Demodulator Circuit Board.

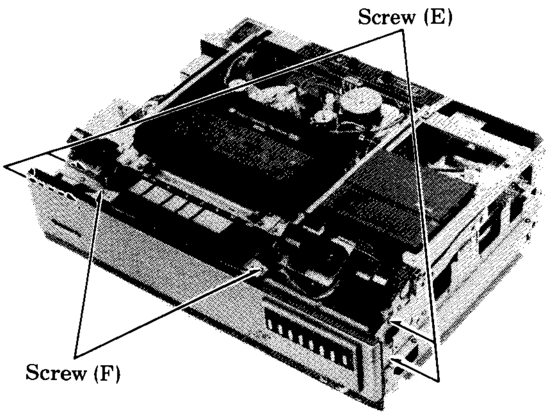

Screw (E)
Screw (F)

Fig. 6

2-6. Removal of the Cassette Cover

1. Press the Eject Button to raise the Cassette Compartment.
2. Unscrew the 4 screws (G) and remove the Cassette Cover.

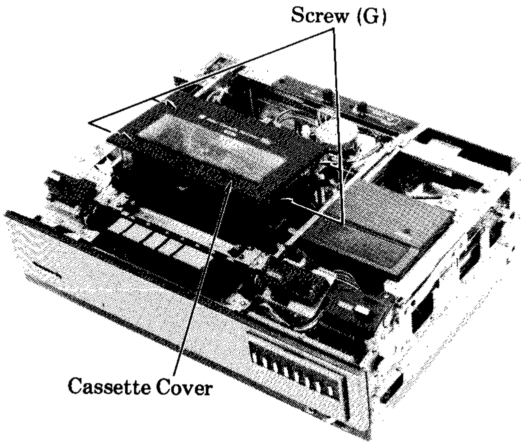

Screw (G)
Cassette Cover

Fig. 7

2-7. Removal of the Cassette Guide

Unscrew the 2 screws (H) and remove the Cassette Guide.

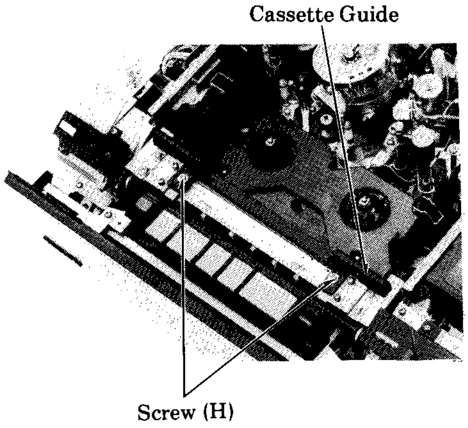

Cassette Guide
Screw (H)

Fig. 8

2-8. Removal of the Cassette Up Holder

Unscrew the 4 screws (I) and remove the Cassette Up Holder.

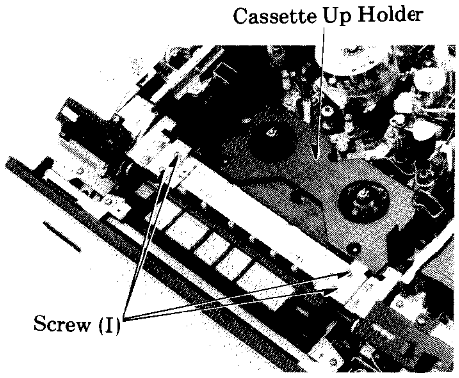

Cassette Up Holder
Screw (I)

Fig. 9

2-9. Opening the Bottom Circuit Boards

Unscrew the 6 screws (J) securing the circuit boards to the frames for replacements or adjustments of the parts which are located under the chassis.

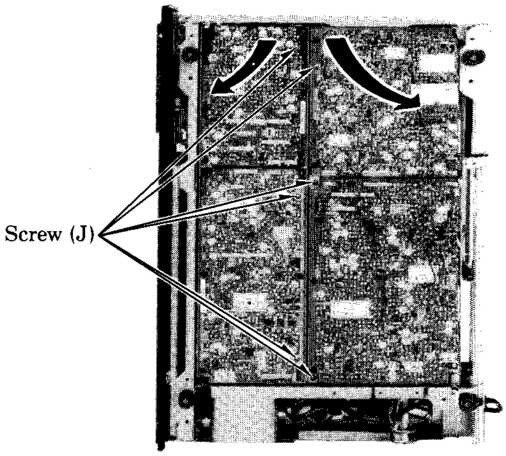


Fig. 10

2-10. Removal of the Cassette Compartment

1. Press the Eject Button to raise the Cassette Compartment.
2. Unscrew the 4 screws (K) and remove the Cassette Compartment.

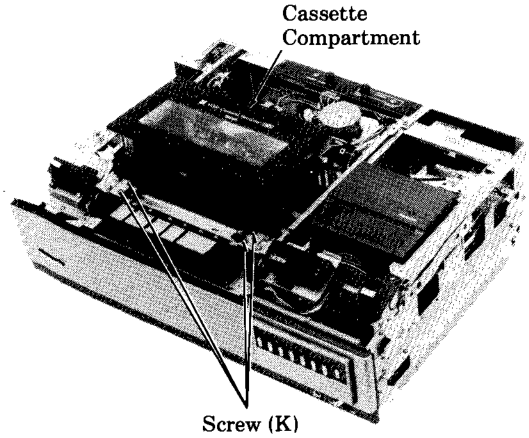

Cassette Compartment
Screw (K)

Fig. 11

Mechanical Maintenance Procedures

1. REPLACEMENT OF THE VIDEO HEAD DISC

1. Remove the Top panel. (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Press the Eject button to raise the Cassette Compartment, preventing the video heads from being damaged.
3. Unscrew the screw (A) and remove the brush unit.
4. Unscrew the 2 screws (B) and remove the wire guide.
5. Unsolder the 4 lead wires of the video heads from the head relay board and remove the Video Head Disc (Upper Cylinder).

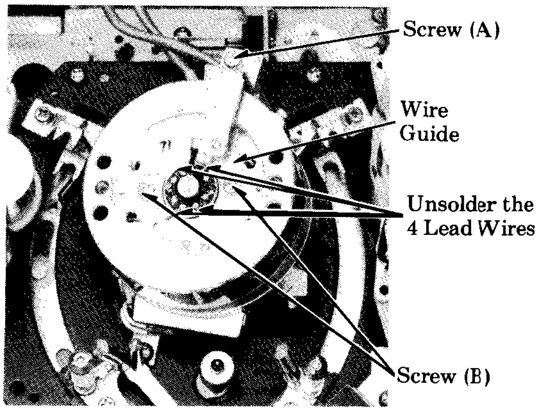

Screw (A)
Wire Guide
Unsolder the 4 Lead Wires
Screw (B)

Fig. 12

6. Clean the flange, bottom and rotative surface of the new Video Head Disc with a soft cloth dampened with alcohol or freon liquid.
7. Place the new Video Head Disc on the head disc base so that the screw holes match.
8. Solder the 4 lead wires to the head relay board, be sure to match the wire colors and tighten the 2 screws (B) with the wire guide.
9. Place the brush unit with a screw (A).

2. REPLACEMENT AND ADJUSTMENT OF DD CYLINDER UNIT

A. Replacement Procedure

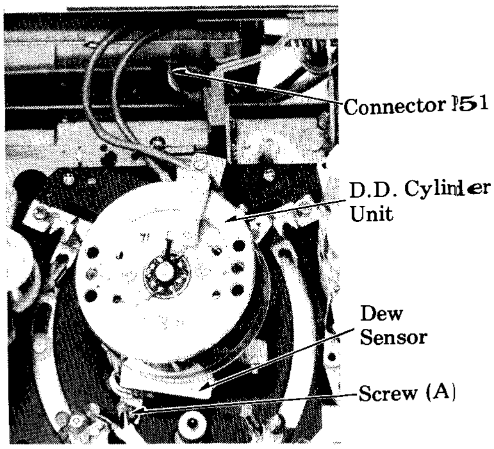

Connector P51
D.D. Cylinder Unit
Dew Sensor
Screw (A)

Fig. 13

1. Remove the Top Panel, the Rear Panel, the Bottom Plate and the Cassette Cover. (Refer to section "DISASSEMBLY METHOD" Items 2-1, 2-2, 2-3 and 2-6).
2. Disconnect the connector P51 on the Head Amp. C.B.A. (VEP0536A1) and remove the 2 wire clampers.
3. Unscrew the screw (A) and remove the Dew Sensor.
4. Place the unit vertically so that the left side board is facing down.
5. Unscrew the 6 screws and open the bottom side circuit boards. (Refer to section "DISASSEMBLY METHOD" Item 2-9).
6. Remove the wires connected to P24 on the Servo Control C.B.A (VEP0289A) from the DD Cylinder, from the wire clampers.

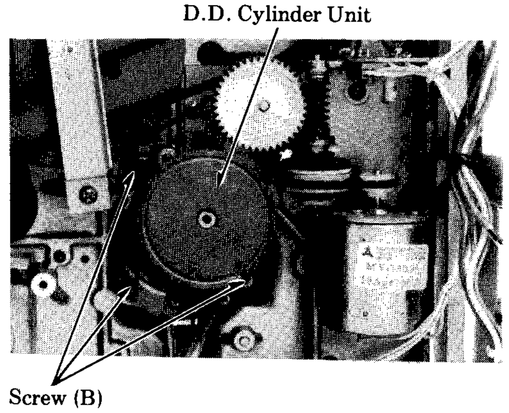


Fig. 14

7. Unscrew the 3 screws (B) securing the DD Cylinder Unit and remove it from the chassis.
8. Clean the surface of the new DD Cylinder Unit with a soft cloth dampened with alcohol or freon liquid.
9. Mount the new DD Cylinder Unit and reverse the above steps to complete the installation.

B. Adjustment Procedure

When the DD Cylinder Unit is replaced, the tape interchangeability should be checked. (Refer to section "TAPE INTERCHANGEABILITY ADJUSTMENT" Item 28).

3. REPLACEMENT AND ADJUSTMENT OF THE AUDIO/CONTROL HEAD BASE UNIT

A. Replacement Procedure

1. Remove the Top Panel. (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Unscrew the 2 screws (A), remove the A/C Head Unit.
3. Unscrew the screw (B) and remove the relay board (VJB 00315).
4. Unsolder the 6 lead wires.
5. Install a new A/C Head Base Unit and reverse the above steps to complete the installation.

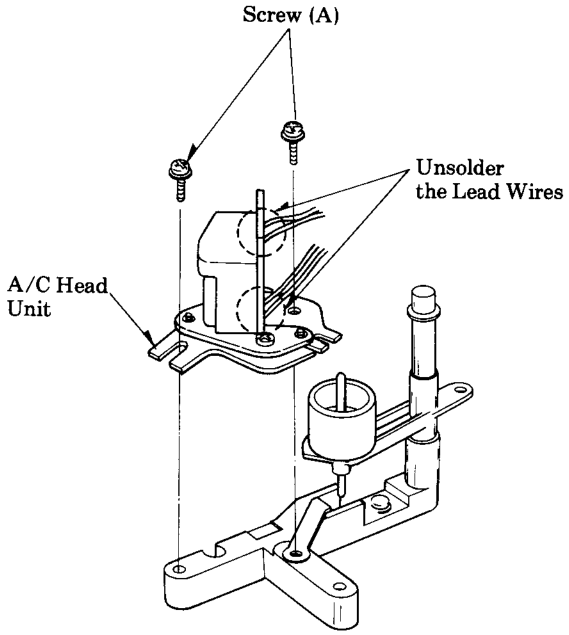


Fig. 15

B. Adjustment Procedure

The height and tilt adjustment procedures of the A/C Head are described in "TAPE INTERCHANGEABILITY ADJUSTMENT", Item 28.

Note: When installing, be care not to contact the wires connected from the relay board VJB00315 to the sensor lamp, with the pressure roller.

4. REPLACEMENT OF THE CAPSTAN MOTOR

A. Replacement Procedure

1. Remove the Top Panel, Bottom Plate and open the Bottom P.C. Boards. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-3 and 2-9).
2. Remove the Capstan Belt and Reel Belt from the Capstan Motor Pulley.

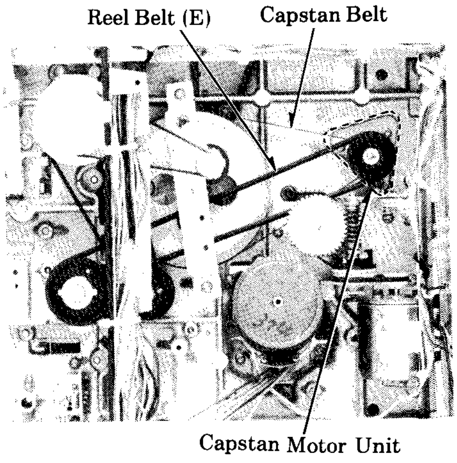


Fig. 16

3. Remove the Inertia Roller Spring (C) and connector P605 on the VJB00171.
4. Unscrew the 3 screws (A) and remove the Capstan Motor Unit from chassis.

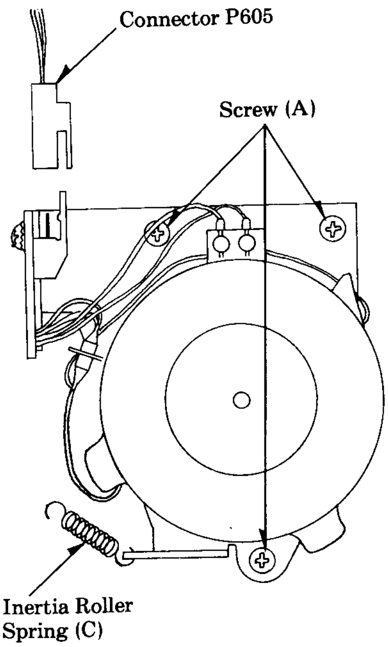


Fig. 17

5. Install the new Capstan Motor and reverse the above steps to complete the installation.

5. MEASUREMENT OF TAPE SPEED AND REPLACEMENT OF CAPSTAN BELT

A. Measurement Procedure

* *Equipment Required:*
Frequency Counter
VHS Alignment Tape VFM8100H3D

* *Specification:* 600 ± 1.5 Hz

1. Remove the Top Panel. (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Connect the frequency counter of FG head terminal of the Capstan Motor.
3. Playback the alignment tape and wait until the tape running has well stabilized.

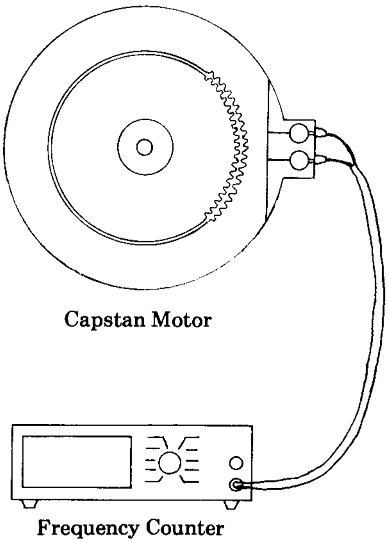


Fig. 18

4. Take the read of the frequency counter and make sure that it is 600 ± 1.5 Hz.
5. When the tape speed is out of the specification, replace the capstan belt.

B. Replacement Procedure

1. Remove the Bottom Plate and unscrew 6 red screws securing P.C.Boards and open the P.C.Boards. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9)
2. Remove the thrust holder unit and remove the reel belt.
3. Then, change the capstan belt to obtain the correct speed. (VDV0094A, VDV0094B, VDV0094C).

Note: Instal the capstan belt so that the marked side comes outside.

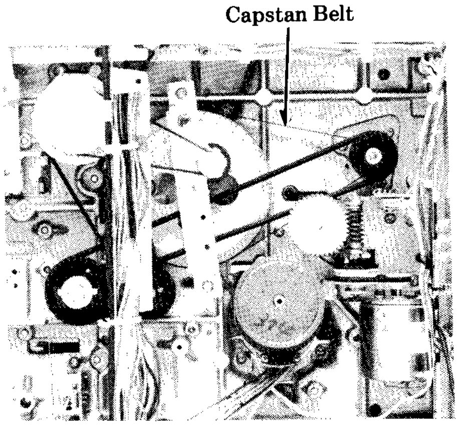


Fig. 19

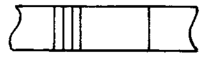
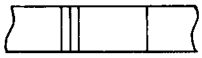
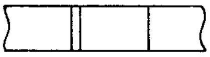
Part No.	Marking	Speed Range
VDV0094A		Slow ↑
VDV0094B		Center ↓
VDV0094C		Fast

Fig. 20

6. REPLACEMENT AND FITTING ADJUSTMENT OF CASSETTE UP HOLDER

A. Replacement Procedures

Refer to section "DISASSEMBLY METHOD", Items 2-2, 2-6, 2-7 and 2-8.

B. Adjustment Procedure

* *Equipment Required*
Cassette Holder Jig (VFK0142)

1. Install the Cassette Up Holder.
2. Set the 4 screws (A) and screw them a few turns only.

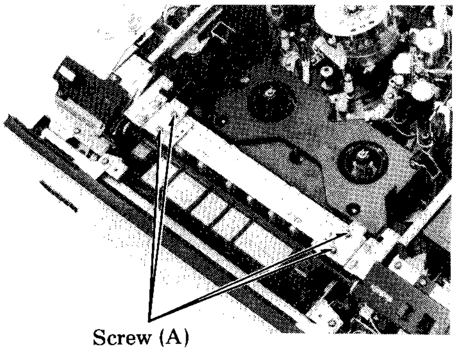


Fig. 21

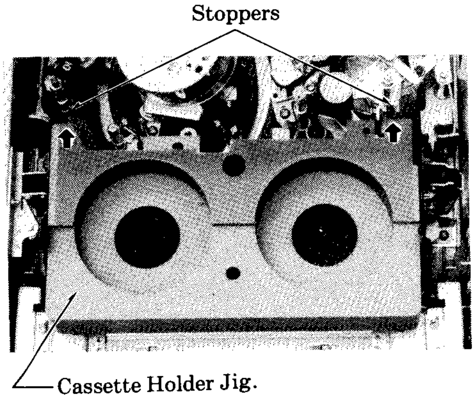


Fig. 22

3. Insert the cassette holder jig untill it touches the stoppers of Cassette Up Holder.
4. While pressing the jig down until Cassette Up Holder latches, adjust the position so that it has smooth movement and correct position.
5. Tighten the 4 screws (A).
6. Press the Eject Button and make sure that it's smooth ejection.
7. Press the Cassette Up Holder down,and make sure that it's normal motion.
8. Repeat above items 6 and 7 to re-confirm.

7. MEASUREMENT AND ADJUSTMENT OF THE BACK TENSION

- * *Specification:* 25—30g
- * *Equipment Required:*
  Back tension Meter (Tentelometer Made in the U.S.A.)
  VHS Cassette Tape

A. Measurement Procedure

1. Remove the Top Panel. (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Pull the Supply Inertia Roller in the direction indicated by arrow and hold it with adhesive tape.
3. Playback the cassette tape and wait until the tape running has stabilized (5—10 seconds).
4. Set a tension meter in front of the Supply Inertia Roller and take the read of the meter.

Note: When measuring, make sure that the three posts of the meter are all in good contact with the tape, but out of contact with Supply Inertia Roller.

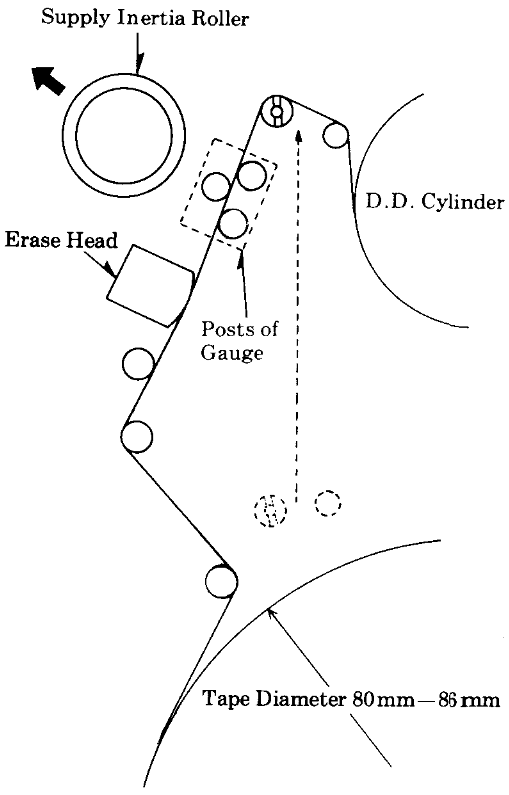


Fig. 23

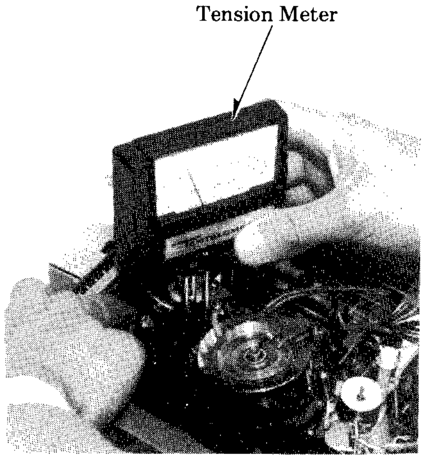


Fig. 24

B. Adjustment Procedure

- * *Equipment Required*
  Fine Adjustment Screwdriver (VFK0136)

1. Loosen the screw (A) and set the fine adjustment screwdriver into the hole (B).
2. Move the Threading Spring Hook in either of direction indicated by arrow.
3. Upon completion of adjustment, tighten the screw (A) and remove the adhesive tape for holding inertia roller.

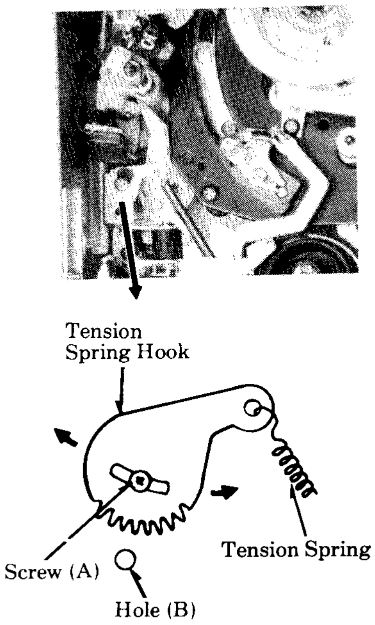

Tension
Spring Hook
Screw (A)
Tension Spring
Hole (B)

Fig. 25

8. ADJUSTMENT OF EJECT LINK CLEARANCE

* *Specification:* 0.5—1.0mm

* *Equipment Required:*
Cassette Lock Arm Adjusting Jig (VFK0140)

A. Adjustment Procedure

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-7 and 2-10).
2. Place the cassette lock arm adjusting jig, loosen the screw (A) and displace the Lever to have the clearance controlled within 0.5—1.0mm.
3. Upon completion of adjustment, tighten the screw (A).
(The diameter of the wire of an ordinary paper clip is about 0.9mm).

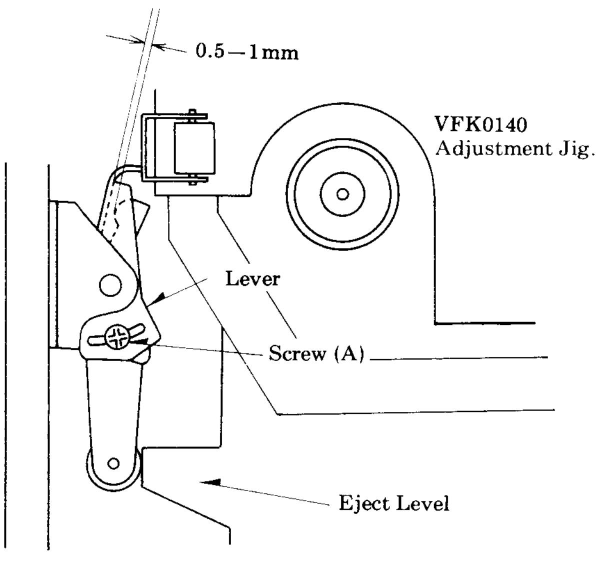

0.5—1mm
VFK0140
Adjustment Jig.
Lever
Screw (A)
Eject Level

Fig. 26

Notes:

1. When adjusting, make sure that the Eject Lever is reset perfectly.
2. Upon completion of the adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

9. MEASUREMENT/ADJUSTMENT OF BRAKING FORCE AND REPLACEMENT OF BRAKE UNITS A & B

* *Specification:*
Braking force: A......(450—650g-cm)
B......(70—130g-cm)
C......(65—135g-cm)

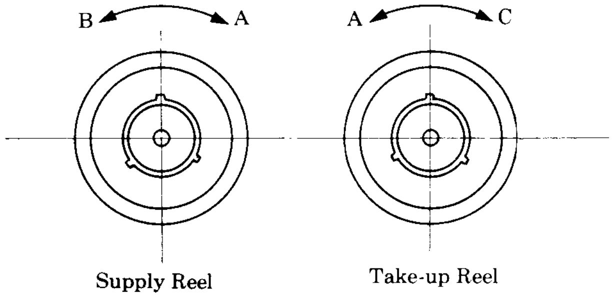

B
A
A
C
Supply Reel
Take-up Reel

Fig. 27

A. Measurement Procedure

* *Equipment Required:*
Dial Torque Gauge (VFK0133)
Adaptor (VFK0134)

1. Remove the Top Panel and Cassette Cover. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-6).
2. Attach the adaptor to the torque gauge.
3. Set the torque gauge to the Reel Table in STOP mode.
4. Rotate the gauge slowly in the each directions and take the reading at the moment when the Reel Table begins slipping.

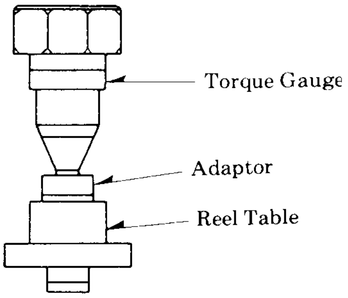

Torque Gauge
Adaptor
Reel Table

Fig. 28

B. Adjustment Procedure

1. For adjustment of braking force A, change the spring position, selecting the proper notch.
2. The braking forces B and C are only to be measured. (It is more important that force A be correct).

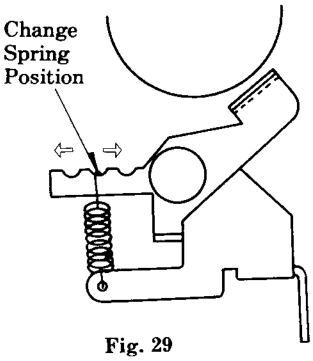

Change
Spring
Position

Fig. 29

C. Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4mm (VFK0145)
After adjustment, it is still out of specification, then replace the Brake Unit.

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD" Items 2-1, 2-7 and 2-10).
2. Remove the Counter Belt A.
3. Unscrew the screw (A), remove the Shaft Guide Angle, and the Eject Link Unit.
4. Unscrew the 2 screws (B) and lift the Connecting Lever with Cassette Arm A Unit, so that the Connecting Lever stands vertically.
5. Remove the Brake Arm Springs.
6. Remove the Retaining Ring (S) and Brake Unit A or B which is needed replacement, or both of them.
7. Install a new Brake Unit and reverse the above steps to complete installation.

Note: When the Brake Unit is replaced, following adjustments should be checked. (Refer to sections "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" and "ADJUSTMENT OF EJECT CLEARANCE" for details.)

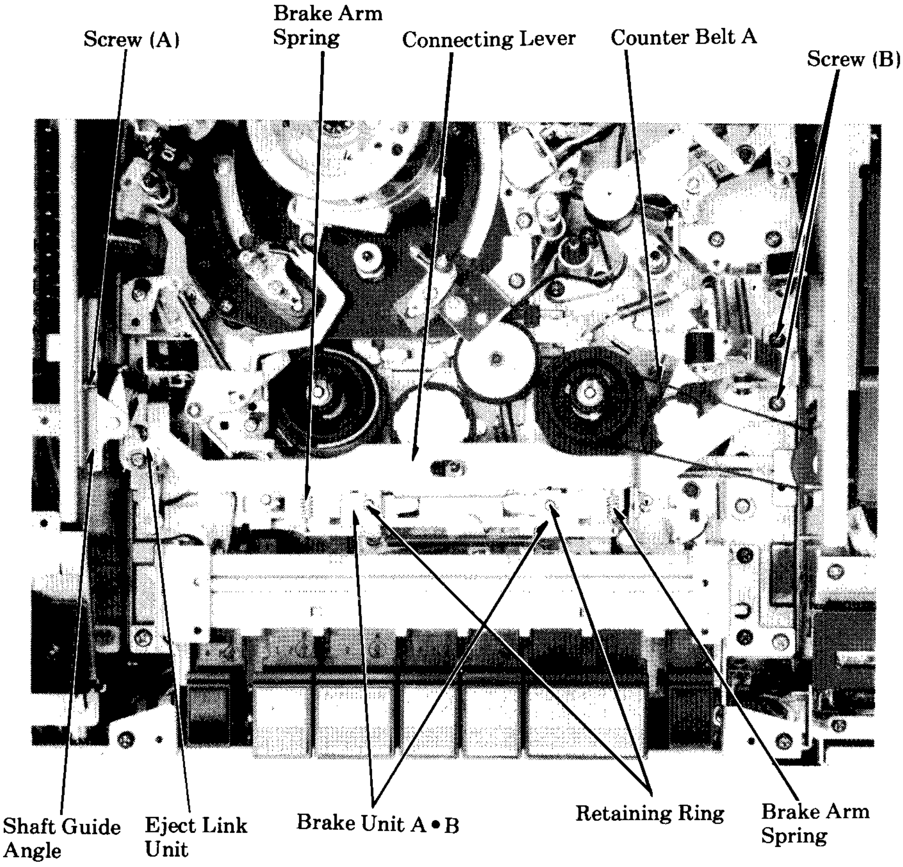

Screw (A)
Brake Arm Spring
Connecting Lever
Counter Belt A
Screw (B)
Shaft Guide Angle
Eject Link Unit
Brake Unit A • B
Retaining Ring
Brake Arm Spring

Fig. 30

10. REPLACEMENT AND ADJUSTMENT OF THE CASSETTE ARM UNITS A & B

A. Replacement Procedure

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-7 and 2-10).
2. Remove the Counter Belt A.
3. Unscrew the screw (A), remove Shaft Guide Angle and Eject Link Unit.
4. Unscrew the 2 screws (B) and 2 screws (C) and remove the Connecting Lever with the Cassette Arm Unit A and B.
5. Remove Retaining Ring (S) which secures Cassette Arm Unit on the Connecting Lever.
6. Remove the Cassette Arm Unit A or B which is needed replacement, or both of them.
7. Install a new Cassette Arm Unit and reverse the above steps to complete the installation.

B. Adjustment Procedure

* *Equipment Required*
Cassette Arm Adjusting Jig (VFK0140)

1. Install new part, tighten 2 screws (B) and set 2 screws (C) temporally.
2. Install the eject Link Unit, Shaft Guide Angle and tighten screw (A).
3. Place the Cassette Arm Adjustment Jig with detachable adaptor on the righthand holes.
4. Adjust the position of Cassette Arm Unit to have the specified clearance (0—0.5mm) between Roller and jig, then tighten 2 screws (C).

Note: When the Cassette Arm Units are replaced, following adjustments should be checked. (Refer to sections "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" and "ADJUSTMENT OF EJECT LINK CLEARANCE" for details.

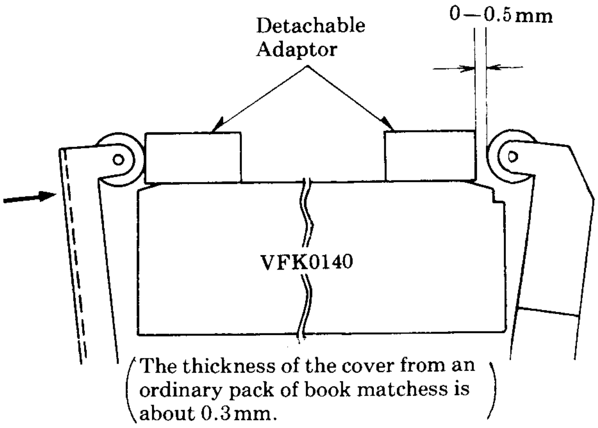

Detachable
Adaptor
0—0.5mm
VFK0140
(The thickness of the cover from an ordinary pack of book matchess is about 0.3mm.)

Fig. 31

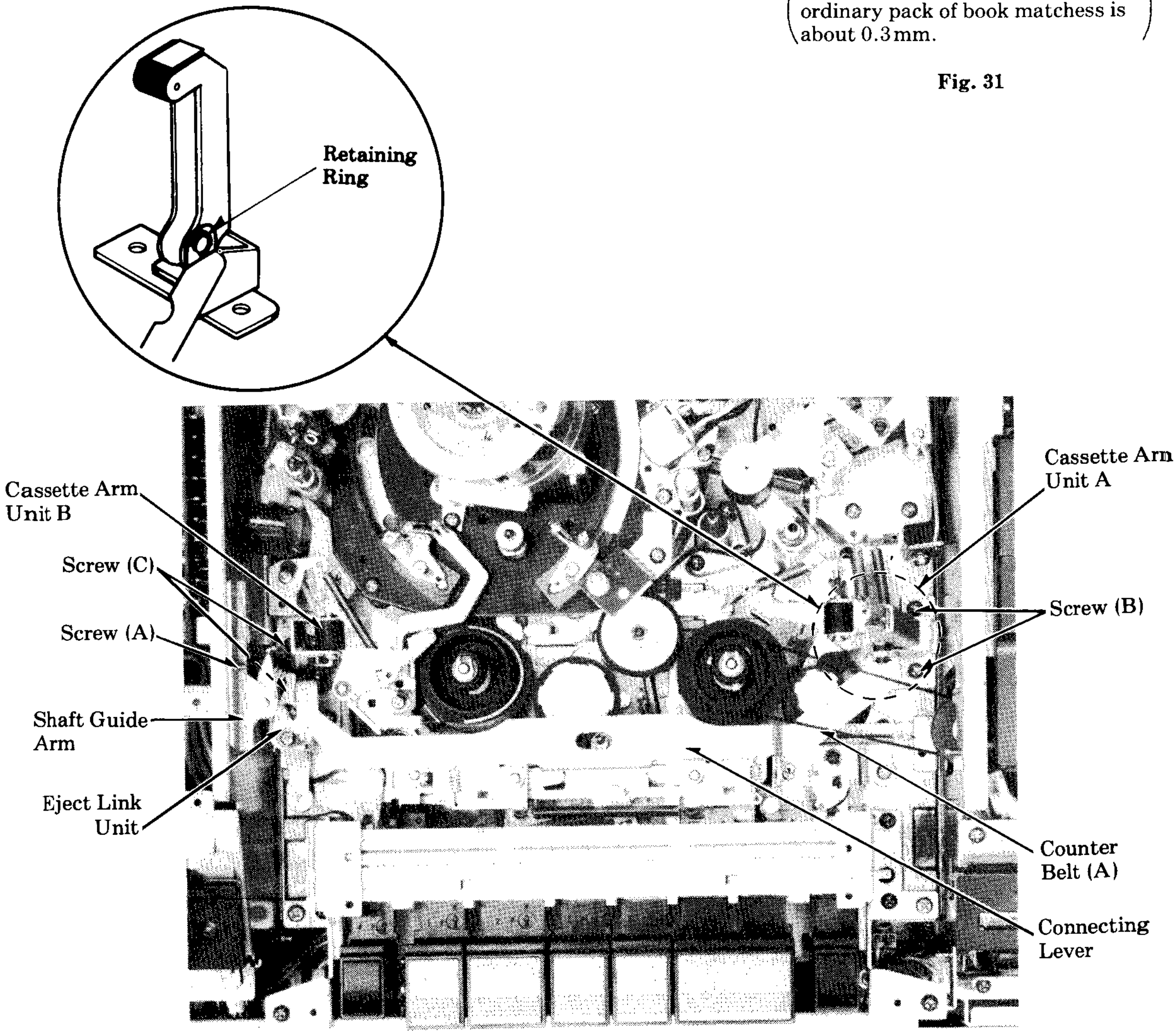

Retaining Ring
Cassette Arm Unit B
Screw (C)
Screw (A)
Shaft Guide Arm
Eject Link Unit
Cassette Arm Unit A
Screw (B)
Counter Belt (A)
Connecting Lever

Fig. 32

11. REPLACEMENT OF THE PRESSURE ROLLER UNIT

Replacement Procedure

1. Remove the spring A.
2. Remove the Retaining ring (B), and remove the Pressure roller unit.
3. Install new pressure roller unit.

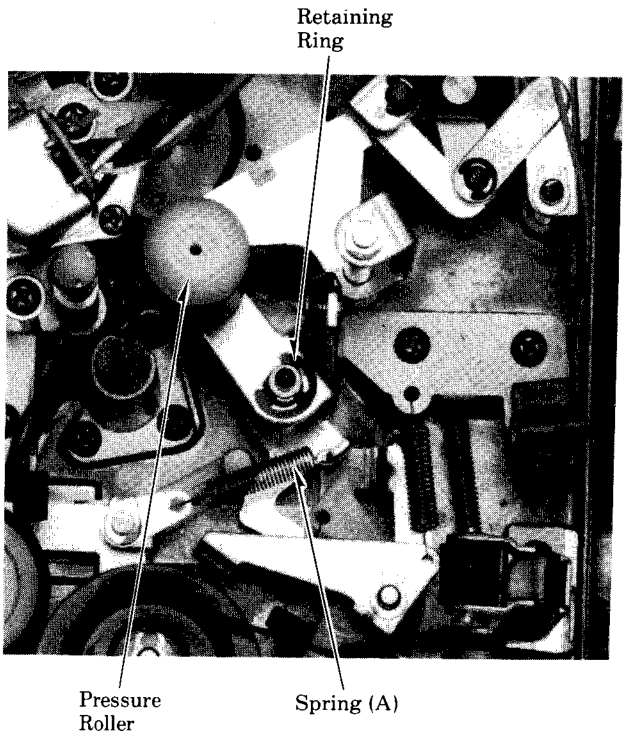

Retaining Ring
Pressure Roller
Spring (A)

Fig. 33

12. REPLACEMENT AND ADJUSTMENT OF THE CAPSTAN HOLDER

A. Replacement Procedure

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-7 and 2-10).
2. Remove the Pressure Roller Unit. (Refer to section "REPLACEMENT OF PRESSURE ROLLER UNIT").
3. Remove the Oil Cap, Oil Pool, unscrew the 3 screws (A) and remove the Capstan Holder.
4. Install a new Capstan Holder and reverse the above steps to complete the installation.

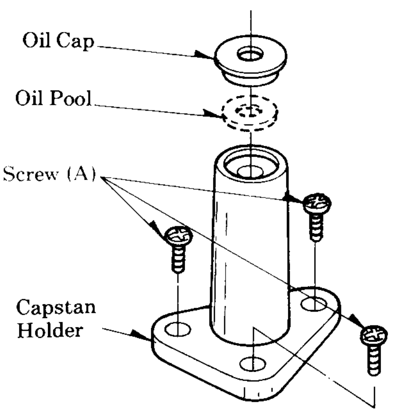

Oil Cap
Oil Pool
Screw (A)
Capstan Holder

Fig. 34

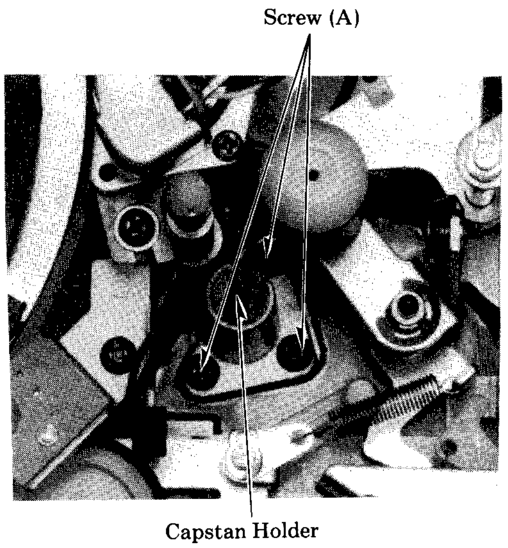

Screw (A)
Capstan Holder

Fig. 35

B. Adjustment Procedure

* *Equipment Required*

Capstan Reference Plate (VFK0141)

1. Install new Capstan Holder and set the 3 screws (A) temporally.
2. Place the jig, press and fit the Capstan Holder against the jig.
3. Tighten the 3 screws (A).

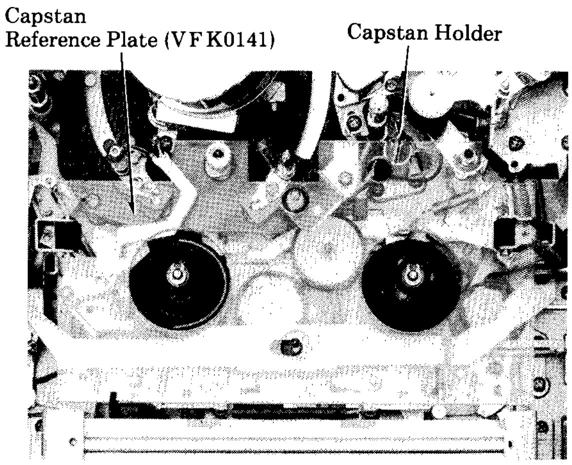

Capstan Reference Plate (VFK0141)
Capstan Holder

Fig. 36

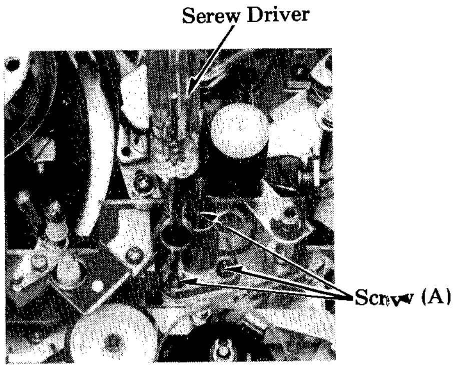

Serew Driver
Screw (A)

Fig. 37

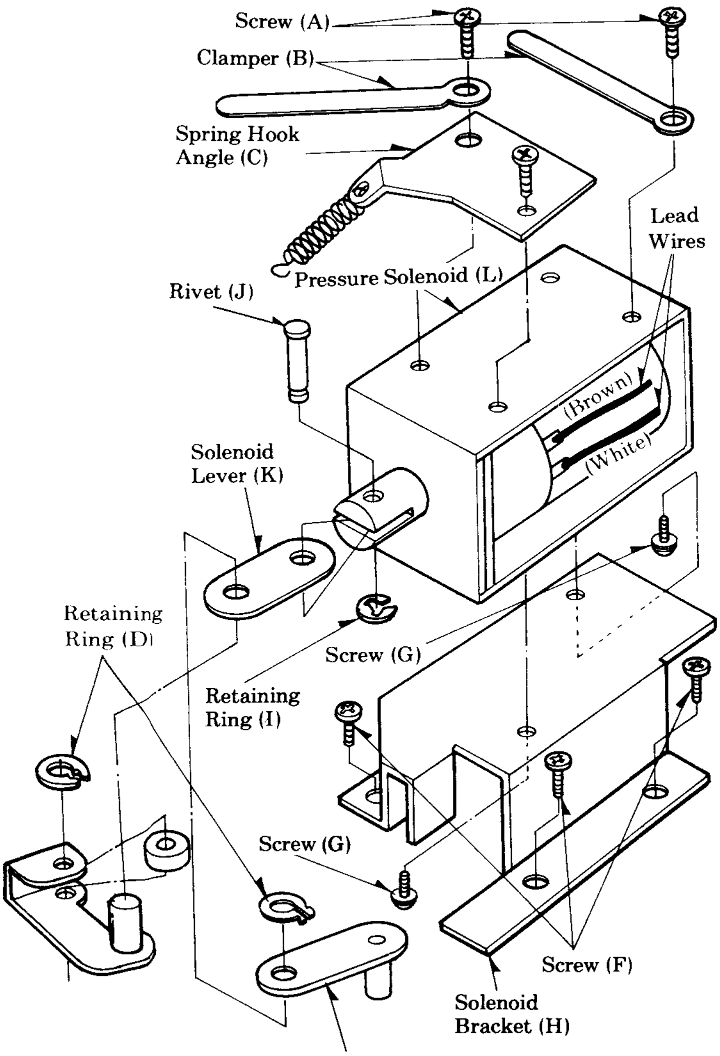
Note: When the Capstan Holder is replaced, following adjustments should be checked. (Refer to sections "ADJUSTMENT OF PRESSURE ROLLER UNIT", "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" for details).

13. REPLACEMENT OF PRESSURE ROLLER SOLENOID/ ADJUSTMENT OF SPRING HOOK LEVER AND CONFIRMATION OF PRESSING FORCE

A. Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4 mm (VFK0145)

1. Remove the Top Panel. (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Unscrew the 2 screws (A), remove the 2 screws (B) and Spring Hook Angle (C).
3. Remove the 2 Retaining Rings (D) and Connecting Lever B Unit (E).
4. Unscrew the 3 screws (F) and remove the Roller Solenoid with Bracket.
5. Unsolder the 2 lead wires (brown and white) from the solenoid.
6. Unscrew the 2 screws (G) and remove the Solenoid Bracket (H), Retaining Ring (I), Rivet (J) and Solenoid Lever (K).



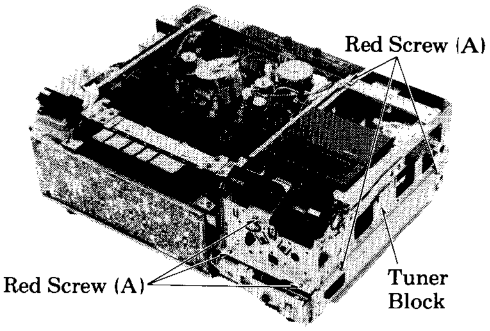
Screw (A)
Clamper (B)
Spring Hook Angle (C)
Lead Wires
Rivet (J)
Pressure Solenoid (L)
(Brown)
(White)
Solenoid Lever (K)
Retaining Ring (D)
Screw (G)
Retaining Ring (I)
Screw (G)
Screw (F)
Solenoid Bracket (H)
Connecting Lever B Unit (E)

Fig. 38

7. Remove the Pressure Solenoid (L).
8. Install a new Pressure Solenoid and reverse the above steps to complete the installation.

B. Adjustment Procedure

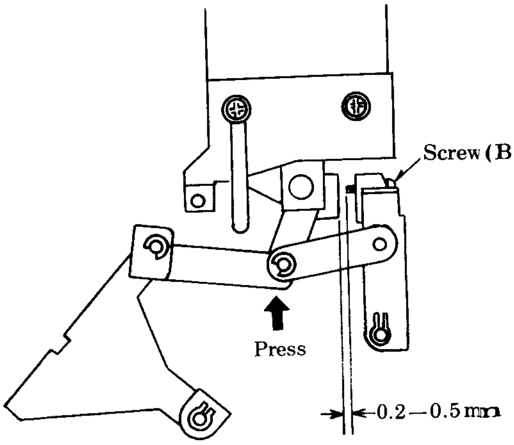
1. Remove the Top Panel, Rear Panel, Side Panels and Front Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-4 and 2-5).
2. Unscrew the 6 red screws (A) and remove the tuner block.



Red Screw (A)
Red Screw (A)
Tuner Block

Fig. 39

3. Press the Solenoid Cylinder with finger to make the PLAY mode, and adjust the screw (B) to have the proper clearance (0.2—0.5 mm)



Screw (B)
Press
0.2—0.5 mm

Fig. 40

C. Confirmation Procedure

* *Equipment Required:*
Fan-type Tension Gauge (VFK66)

1. Playback the Cassette Tape.
2. Set a fan-type Tension Gauge to the part (A) of Pressure Lever.
3. Press the Lever with gauge, in the direction indicated by the arrow.
4. Confirm that the tensionmeter reading is 200 ±200g at the moment tape stops.

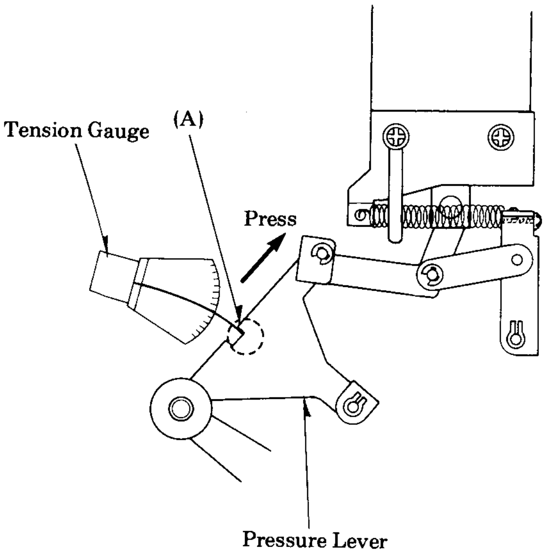

Tension Gauge
(A)
Press
Pressure Lever

Fig. 41

14. POSITION ADJUSTMENT OF TENSION POST

A. Measurement Procedure

* *Equipment Required:*
Ruler

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section, "DISASSEMBLY METHOD", Items 2-1, 2-7 and 2-10).
2. Turn power switch ON.
3. Blind the Supply Photo Transistor (TR6302) with a finger, and press the PLAY button for loading.
4. As soon as loading is completed, turn power switch OFF and repress the PLAY button.
5. Make sure that the Head Cylinder stopped completely, and measure the length.

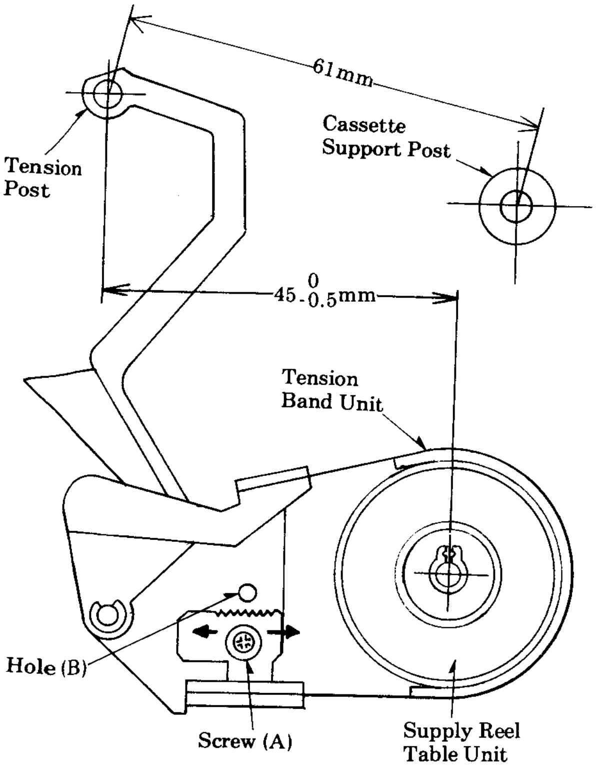

61mm
Cassette Support Post
Tension Post
$45^{0}_{-0.5}$mm
Tension Band Unit
Hole (B)
Screw (A)
Supply Reel Table Unit

Fig. 42

B. Adjustment Procedure

* *Equipment Required:*
Fine Adjustment Screwdriver (VFK0136) Screwdriver (+).
(TENSION POST)
Loosen the screw (A) set a fine adjustment screwdriver to the Hole (B) and adjust the position by displacing the Tension Band Bracket in the directions indicated by arrow.
Notes:

1. After adjustment, playback a cassette tape and make sure that the tape does not come into contact with cassette case when it is loading.
2. Upon completion of the adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

15. ADJUSTMENT OF CASSETTE SUPPORT HEIGHT

Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Hex Wrench—1.5mm (VFK76)

1. Remove the Top Panel, Cassette Guide, and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD" Items 2-1, 2-7 and 2-10).

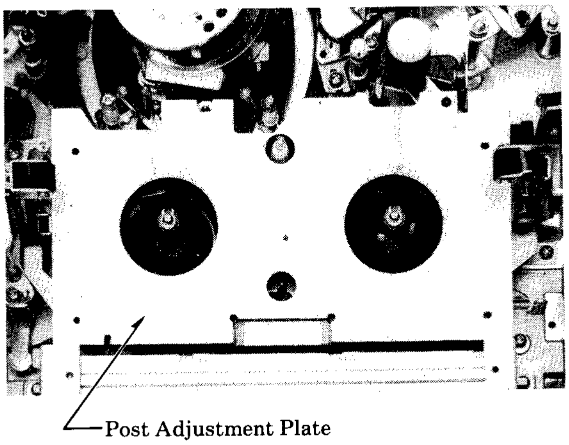

Post Adjustment Plate

Fig. 43

2. Place the Post Adjustment Plate to the proper position and loosen a hex screw.
3. Adjust the height of the cassette support so that it has no clearance between the plate and cassette support, then tighen the hex screw.

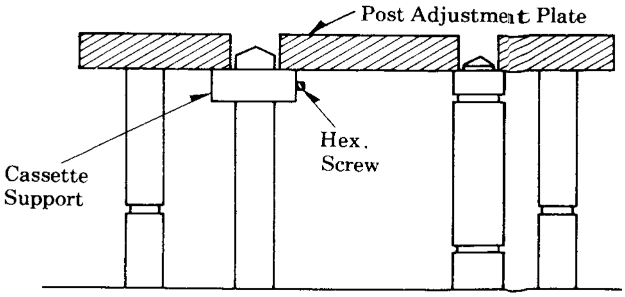

Post Adjustment Plate
Hex. Screw
Cassette Support

Fig. 44

Note: Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

16. REPLACEMENT AND HEIGHT ADJUSTMENT OF REEL TABLES

A. Replacement Procedure

* *Equipment Required:*
Retaining Ring Remover—4mm (VFK0145)
Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-7, and 2-10).

(TAKEUP REEL TABLE UNIT)

1. Remove the Counter Belt B.
2. Remove the Retaining Ring, washer and then the Takeup Table unit can be removed.

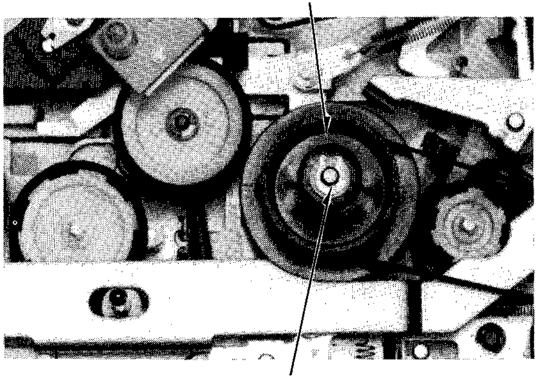

Takeup Reel Table Unit
Retaining Ring

Fig. 45

(SUPPLY REEL TABLE UNIT)

1. Remove the 2 Retaining Rings and 2 washers.
2. Remove the Tension Arm Unit from the shaft and remove the tension spring. And then, remove the Supply Reel Table Unit.
3. Install a new Reel Table and reverse the above steps to complete the installation.

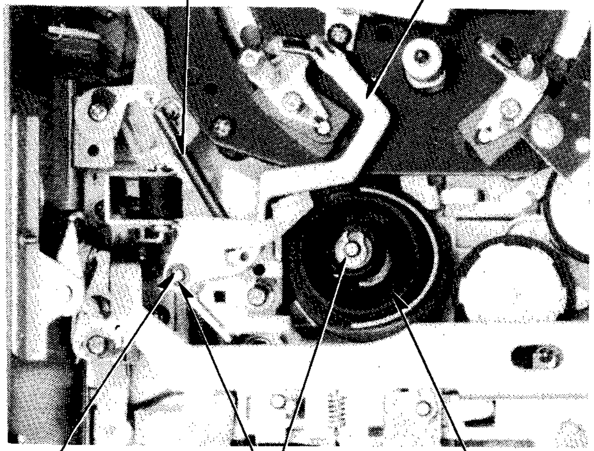

Tension Spring
Tension Arm Unit
Shaft
Retaining Ring
Supply Reel Table Unit

Fig. 46

Notes:

1. Do not put any oil or grease on the Counter Belt, Reel Tables, Idlers or Brake Shoes.
2. Upon completion of adjustment, "FITTING ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

B. Height Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Reel Table Height Jig (VFK0139)
Hex Wrench—1.5mm (VFK76)

1. Place the Post Adjustment Plate in its proper position.

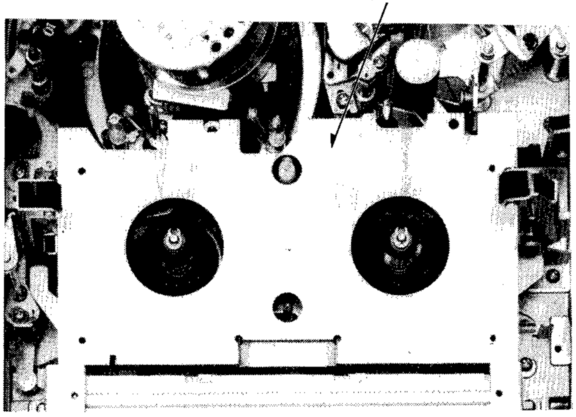

Post Adjustment Plate

Fig. 47

2. Set the Dial Gauge into the U-shaped Block and place it on the Adjustment Plate.
3. Fit the sensor of Dial Gauge on the cut-out of the adjustment plate, and set the pointer to 0 (Zero).

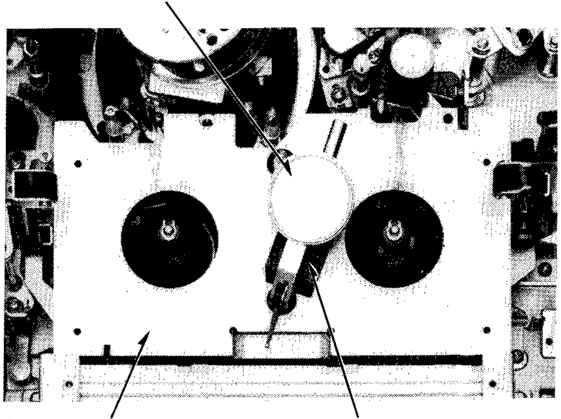

Dial Gauge
Post Adjustment Plate
U-Shaped Block

Fig. 48

4. Fit the sensor of Dial Gauge on the top of Reel Table and take the reading of the gauge.
5. When the difference of the reading is more than 0.1mm, it suggests that the adjustment is needed.

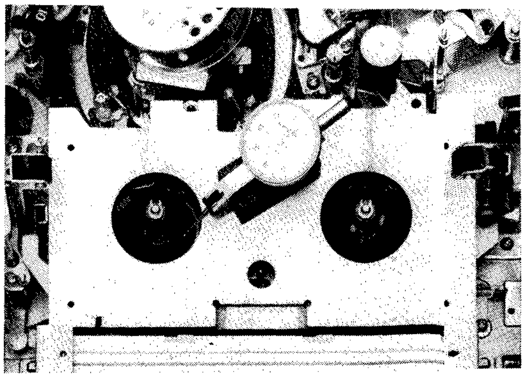


Fig. 49

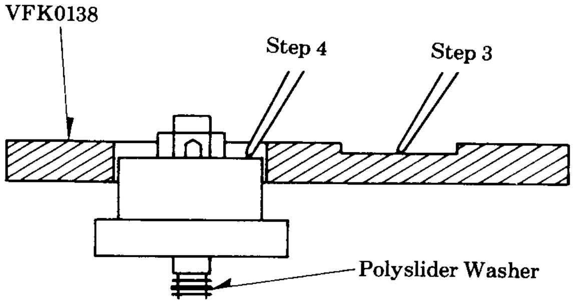


Fig. 50

6. Change the polyslider washer. (The washer is available in in sizes of t=0.13 mm, 0.25 mm and 0.5 mm).
   0.13 mm......XWXV4Z65
   0.25 mm......XWXV4A65
   0.5 mm XWXV4D65

Note: Upon completion of replacement and adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

17. CONFIRMATION OF TAKEUP FORCE

* *Specifications:*
in PLAY......140—200 g-cm
in F.F ......350 g-cm
in REW ......400 g-cm

Confirmation Procedure

* *Equipment Required:*
Dial Torque Gauge (VFK0133)
Adaptor (VFK0134)

1. Remove the Top Panel and Cassette Cover. (Refer to section "DISASSEMBLY METHOD", Items 2-1 and 2-6).
2. Attach the Adaptor to the Torque Gauge.

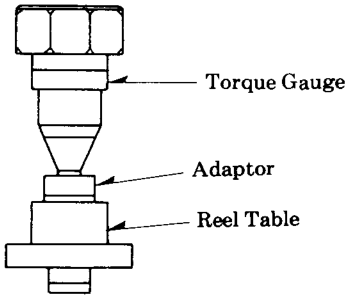


Fig. 51

3. Turn power switch ON.
4. Blind photo Transistor (TR6302, TR6303) with a piece of opaque paper or black tape.
5. Set a Torque Gauge to the Reel Table, press the PLAY button, and take the read of gauge.
6. Make the same measurement for F.F. and Rew. modes.

Notes:

1. When measuring, make sure that there is no slippage between Idler and Reel Table as well as Idlers.
2. When measuring, the weight of Torque Gauge should be free against Reel Tables.
3. Remove piece of paper after confirmation.

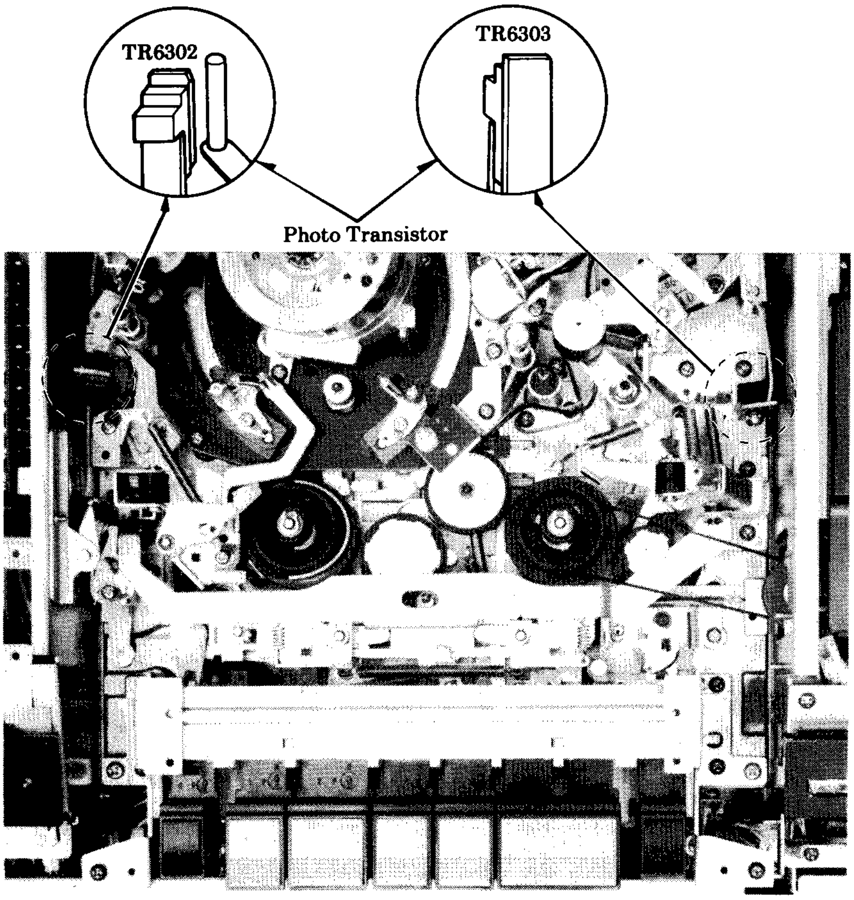


Fig. 52

18. ADJUSTMENT OF TAPE GUIDE POST HEIGHT

Adjustment Procedure

* *Equipment Required:*
Post Adjustment Plate (VFK0138)
Post Adjustment Screwdriver (VFK0137)
Block Gauge (VFK0139)

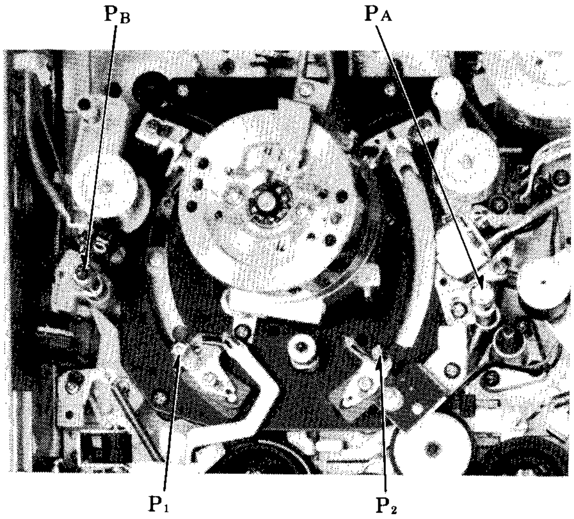


Fig. 53

1. Remove the Top Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-7 and 2-10).
2. Place the Post Adjustment Plate to the proper position and put the Block Gauge on it.

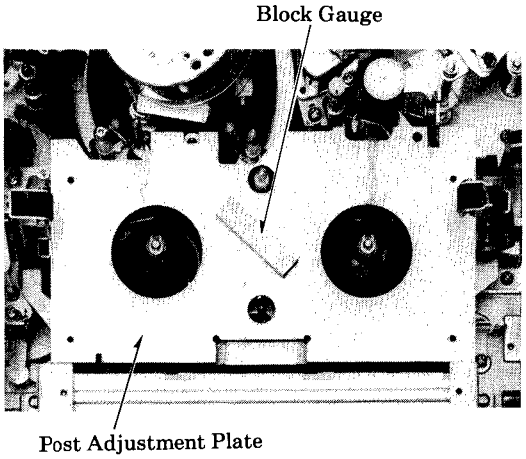

Block Gauge
Post Adjustment Plate

Fig. 54

3. Fit the block gauge against each post.

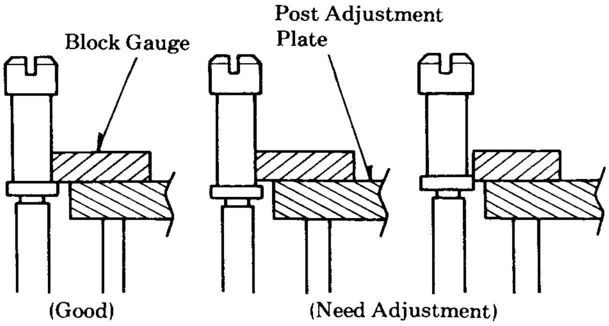

Block Gauge
Post Adjustment Plate
(Good)
(Need Adjustment)

Fig. 55

4. Loosen the locking hex screws of posts, then turn the top of post-1, post-2 with post adjustment screwdriver.
   Use the box driver for adjustment of post P_A, P_B.

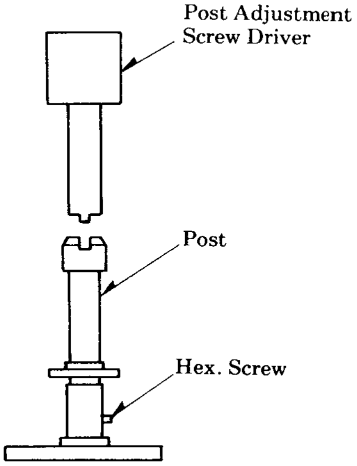

Post Adjustment Screw Driver
Post
Hex. Screw

Fig. 56

Note: Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

19. REPLACEMENT OF BUTTON UNIT AND EACH BUTTON

Replacement Procedure

1. Remove the Top Panel, Front Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-4, 2-5, 2-7 and 2-10).
2. Unscrew the 4 screws (A) on the Transport Board (VEP 0669E1), also disconnect the 5 connectors and remove the board.

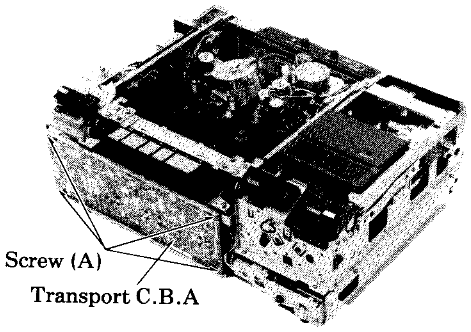

Screw (A)
Transport C.B.A

Fig. 57

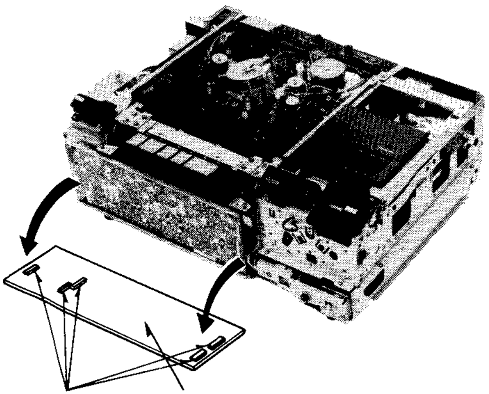

Plug
Transport C.B.A

Fig. 59

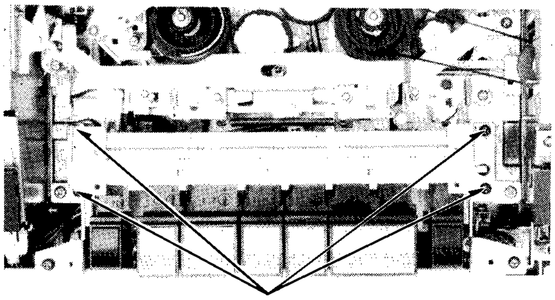


Fig. 58

3. Disconnect the connector P622 for stop solenoid inter connection.
4. Unscrew the 4 screws (A) securing the button unit, remove the button unit from the chassis.
5. Remove the each Button that needs replacement.
6. Install a new button and reverse the above steps to complete the installation.

Note: Upon completion of adjustment, "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

20. REPLACEMENT OF TIMER UNIT

Replacement Procedure

1. Unscrew the 2 screws (A).
2. Unplug the connection plug and remove the Timer Unit.
3. Install a new Timer Unit and reverse the above steps to complete the installation.

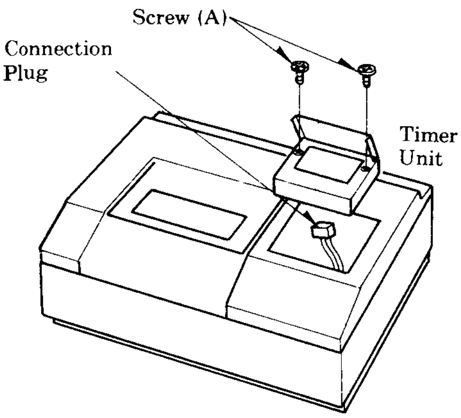

Screw (A)
Connection Plug
Timer Unit

Fig. 60

21. REPLACEMENT OF TAPE COUNTER

Replacement Procedure

1. Remove the Top Panel, Rear Panel, Side Panels and Front Panel. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-2, 2-4 and 2-5).

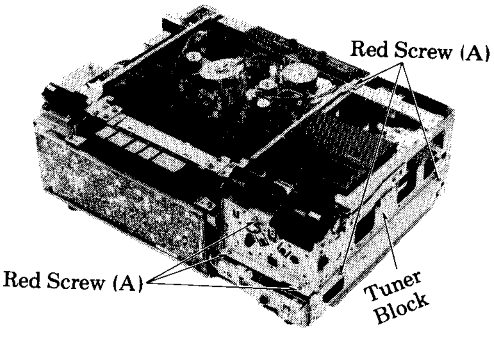

Red Screw (A)
Red Screw (A)
Tuner Block

Fig. 61

2. Unscrew the 2 screws (B) and remove the Counter Cover.

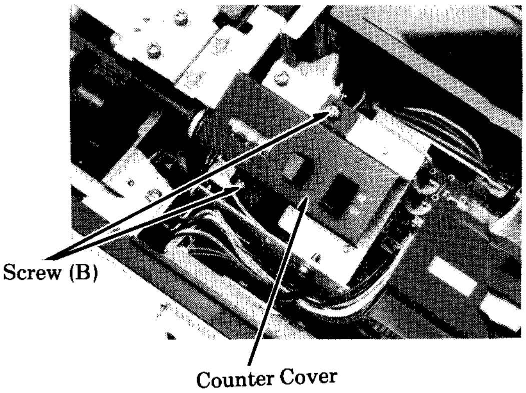

Screw (B)
Counter Cover

Fig. 62

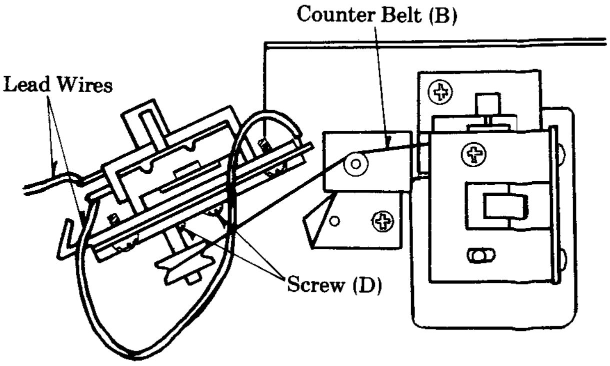

Counter Belt (B)
Lead Wires
Screw (D)

Fig. 63

3. Unsolder the 2 lead wires from the Counter.
4. Unscrew the 2 screws (C) and remove the Counter Base Unit, and take off the Counter Belt B from the Counter Pulley.

5. Unscrew the 2 screws (D) securing the Tape Counter to the counter base. Then remove the Tape Counter.
6. Install a new Tape Counter and reverse the above steps to complete the installation.

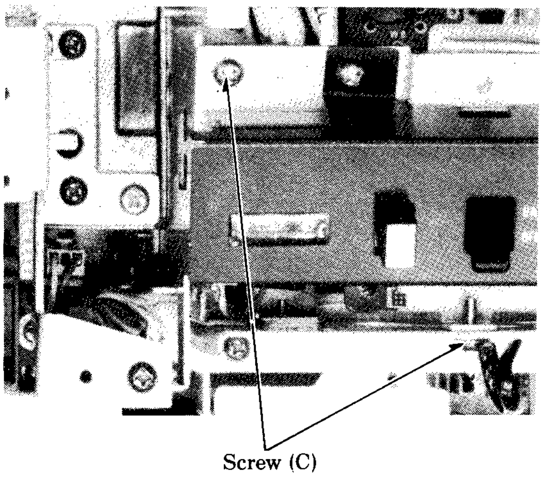


Fig. 64

22. REPLACEMENT OF COUNTER BELT (A & B)

Replacement Procedure

When replacing Belt A, follow the steps 1 and 2.
When replacing Belt B, follow the steps 1 to 6.

1. Remove the Top Panel, Side Panels, Front Panel, Cassette Guide and Cassette Compartment. (Refer to section "DISASSEMBLY METHOD", Items 2-1, 2-4, 2-5, 2-7 and 2-10).
2. Remove the Counter Belt A.

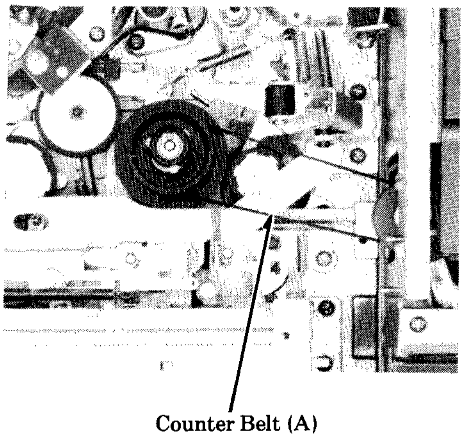

Counter Belt (A)

Fig. 65

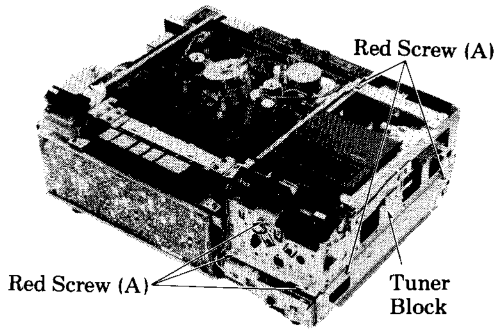

Red Screw (A)
Red Screw (A)
Tuner
Block

Fig. 66

3. Remove the Timer Unit.
4. Unscrew the 2 screws (B) and remove the Tape Counter Base Unit, take off the Counter Belt B from the Counter Pulley.

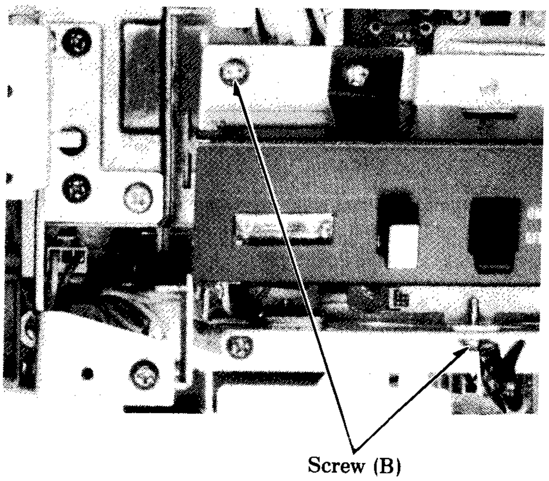


Fig. 67

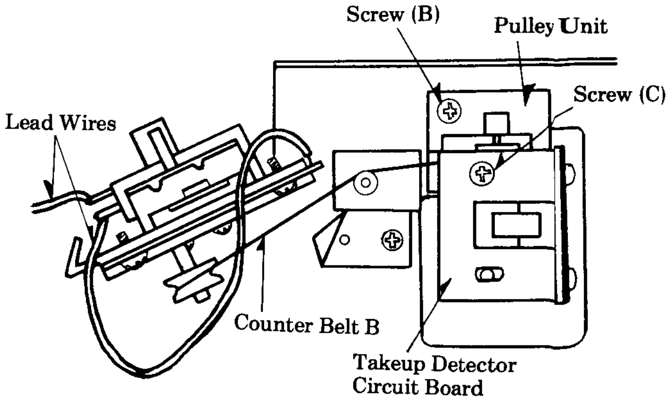

Screw (B)
Pulley Unit
Screw (C)
Lead Wires
Counter Belt B
Takeup Detector
Circuit Board

Fig. 68

5. Unscrew the screw (C), remove the Pulley Unit.
   And then, unscrew the 2 screws (D), remove the takeup detector circuit board.
6. Remove the Counter Belt B.
7. Install a new Belt and reverse the above corresponding steps to complete the installation.

Note: Upon completion of replacement "ADJUSTMENT OF CASSETTE UP HOLDER" also should be checked.

23. REPLACEMENT OF REEL BELT A, B AND CAPSTAN BELT

Replacement Procedure

When replacing Reel Belt A, follow the steps 1 to 4.
When replacing Reel Belt B, follow the steps 1 and 3.
When replacing Capstan Belt, follow the steps 1 to 6.

1. Remove the Bottom Plate and unscrew the 6 screws. (Refer to section "DISASSEMBLY METHOD", Items 2-3 and 2-9).
2. Remove the control Belt from the control pulley unit.
3. Remove the Reel Belt B.
4. Remove the Reel Belt A.
5. Unscrew the 2 screws (B) and remove the Thrust Holder Unit.
6. Remove the Capstan Belt.
7. Install a new belt and reverse the above corresponding steps to complete the installation.

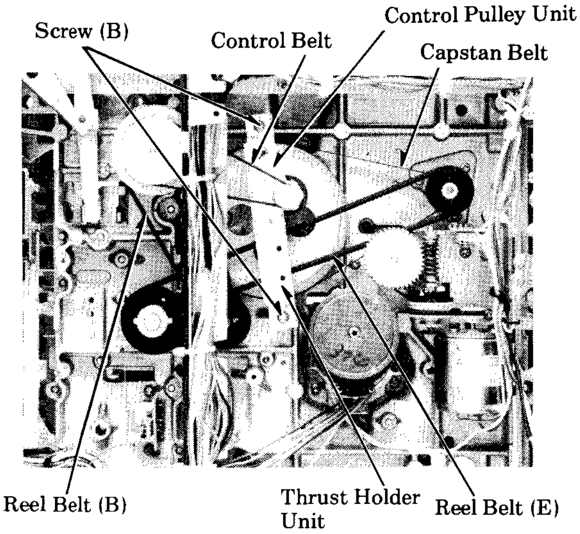

Screw (B)
Control Belt
Control Pulley Unit
Capstan Belt
Reel Belt (B)
Thrust Holder Unit
Reel Belt (E)

Fig. 69

24. REPLACEMENT OF LOADING BELT AND LOADING MOTOR PULLEY UNIT

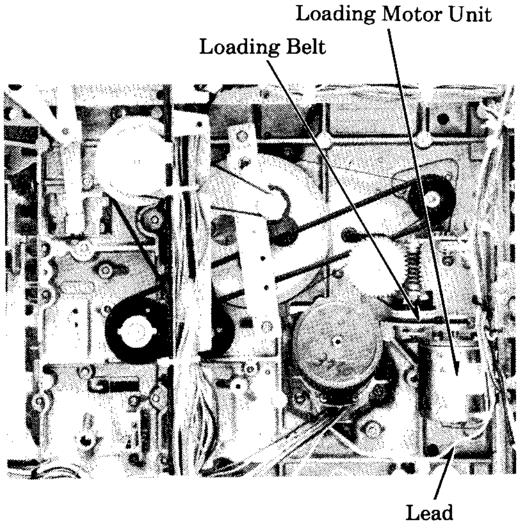

Loading Motor Unit
Loading Belt
Lead

Fig. 70

Replacement Procedure

* *Equipment Required:*
  Hex Wrench—2.6mm (VFK48)
  When replacing Loading Belt, follow the steps 1 to 3.
  When replacing Motor Pulley Unit, follow the steps 1 to 5.

1. Remove the Bottom Plate and unscrew the 6 red screws. (Refer to section "DISASSEMBLY METHOD" Items 2-3 and 2-9).
2. Loosen the screw (A) and turn the guide to the counter-clockwise.
3. Remove the Loading Belt.
4. Unsolder the 2 lead wires from the Motor.
5. Remove the rivet holding the bottom side circuit boards (VEP0846A & VEP0374A).

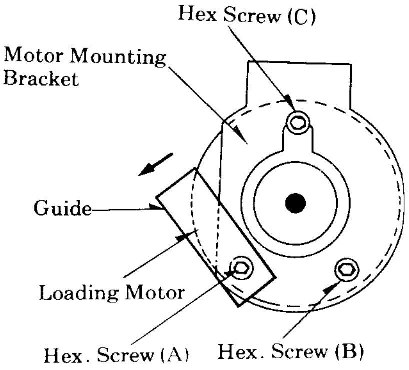

Hex Screw (C)
Motor Mounting Bracket
Guide
Loading Motor
Hex. Screw (A)
Hex. Screw (B)

Fig. 71

6. Unscrew the 2 hex screws (A) and (B), and loosen the hex screw (C).
7. Remove the Loading Motor Pulley Unit.
8. Install a new Loading Motor Pulley Unit and reverse the above steps to complete the installation.

25. REPLACEMENT AND POSITION ADJUSTMENT OF TAPE SLACK SWITCH

A. Replacement Procedure

1. Remove the Bottom Plate and Unscrew the 6 red screws. (Refer to section "DISASSEMBLY METHOD" Items 2-3 and 2-9).
2. Set the unit vertically so that the left side board is facing down.
3. Disconnect the connecting plug (P613) from Micro Switch Connection Board.

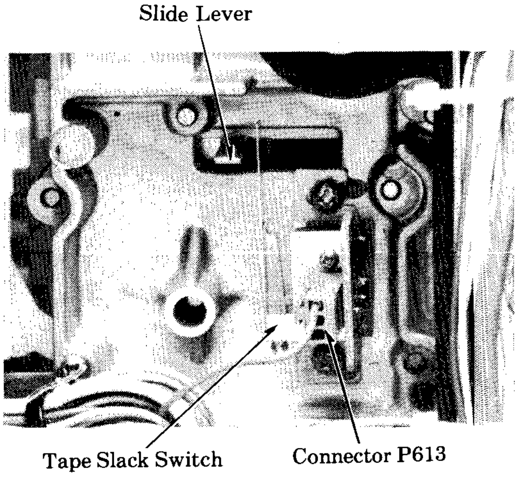

Slide Lever
Tape Slack Switch
Connector P613

Fig. 72

4. Loosen the screw (A) a few turns only, unscrew the screw (B) and remove the Tape Slack Switch.
5. Install new Tape Slack Switch and reverse the above steps to complete the installation.

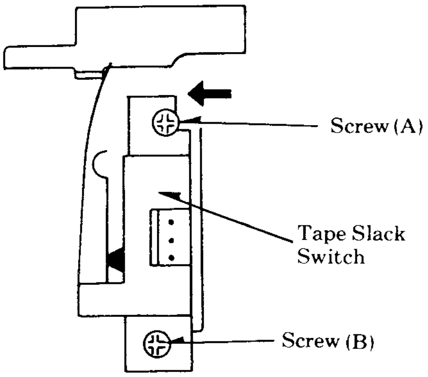

Screw (A)
Tape Slack Switch
Screw (B)

Fig. 73

B. Adjustment Procedure

This switch should turn ON at the moment when the PLAY button latches.

1. Place the switch in its proper position and mount the screw (B) temporally.
2. Press the PLAY button down and lock it.
3. Move the Slack Switch in the direction indicated by the arrow, and tighten both screws at the Slack Switch turns ON.
4. Make sure that the unit begins loading when power switch is turned ON with PLAY Button pressed.

26. REPLACEMENT OF SUPPLY INERTIA ROLLER UNIT

Replacement Procedure

1. Remove the Top Panel, (Refer to section "DISASSEMBLY METHOD", Item 2-1).
2. Remove Retaining Ring and Supply Inertia Roller Unit.
3. Remove the Inertia Roller Spring.
4. Install a new Roller Unit and reverse the above steps to complete the installation.

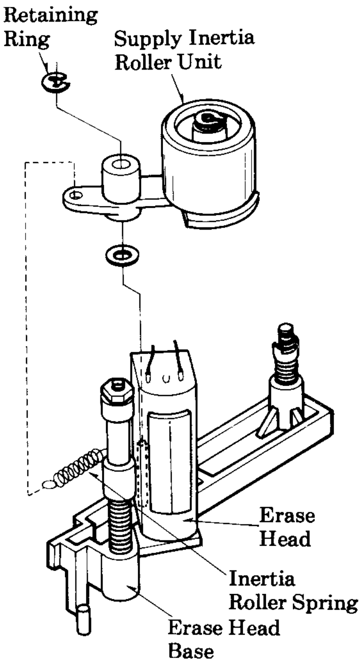

Retaining Ring
Supply Inertia Roller Unit
Erase Head
Inertia Roller Spring
Erase Head Base

Fig. 74

27. REPLACEMENT OF TAKEUP INERTIA ROLLER UNIT

Replacement Procedure

1. Take off the panel support.
2. Pull out the takeup inertia roller unit and remove the inertia roller spring.
3. Install a new Takeup Inertia Roller Unit and reverse the above steps to complete the installation.

Note: Do not put any oil or grease on the surface of the inertia roller.

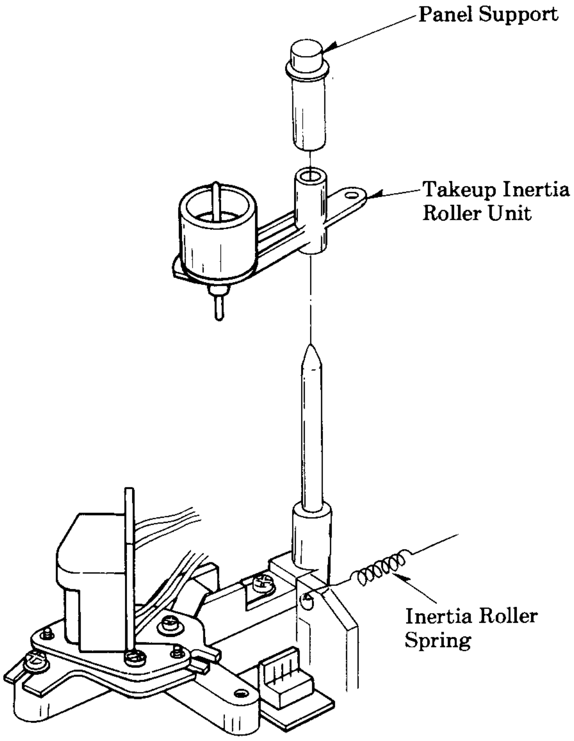

Panel Support
Takeup Inertia Roller Unit
Inertia Roller Spring

Fig. 75

28. TAPE INTERCHANGEABILITY ADJUSTMENT

* *Equipment Required:*
Alignment Tape (VFM8100H3D)
Post Adjustment Screwdriver (VFK0137)
Eccentric Screwdriver (VFK0135)
Hex Wrench—0.9mm (VFK0146)
Hex Wrench—1.5mm (VFK76)
Box Wrench or Plier

A. Pre-adjustment for Posts and Audio/Control Head Height

To prevent the alignment tape from being damaged, use a normal cassette tape for pre-adjustment procedure.

1. Playback a cassette tape and make sure that the edges of the tape are not curling against the edges of the posts P_A, P_1, and P_2, P_B.

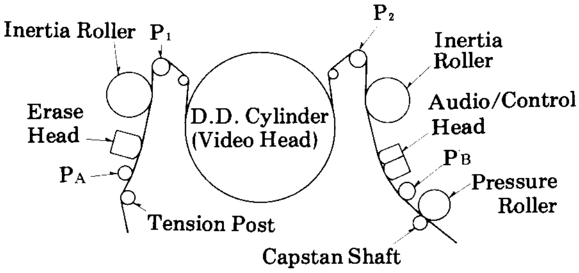

Inertia Roller
P1
P2
Inertia Roller
Erase Head
D.D. Cylinder (Video Head)
Audio/Control Head
PA
PB
Pressure Roller
Tension Post
Capstan Shaft

Fig. 76

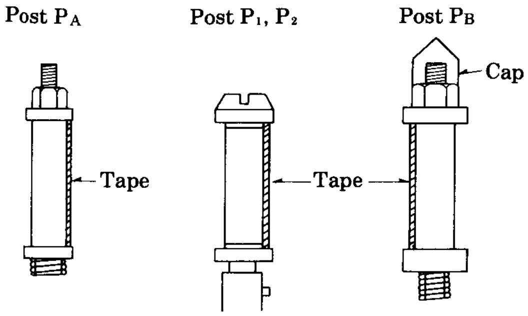

Post P_A
Post P_1, P_2
Post P_B
Cap
Tape
Tape
Tape

Fig. 77

2. If curling is appearing, adjust each post as shown below.
   A) When adjusting Post P_1, P_2, use, the Post adjustment screwdriver VFK0137.
   B) When adjusting Post P_A, P_B, tighten an loosen the nut by using box wrench or plier.

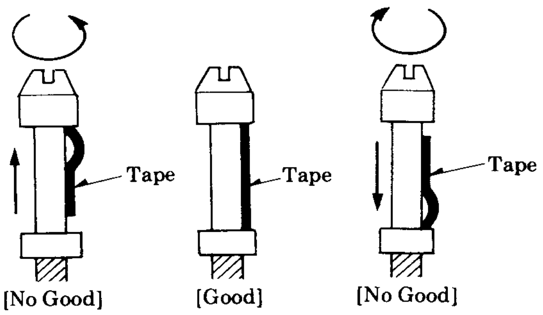

Tape
Tape
Tape
[No Good]
[Good]
[No Good]

Fig. 78

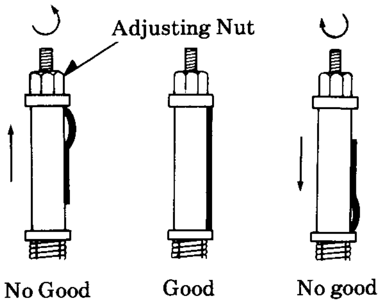
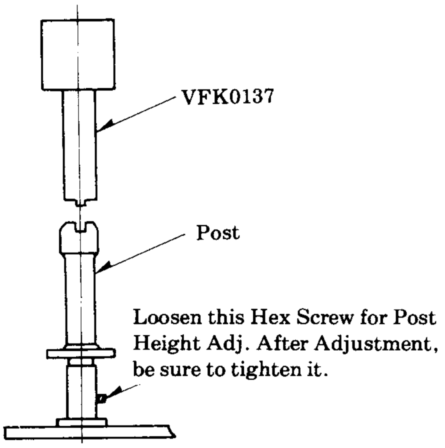

Adjusting Nut
No Good
Good
No good

Fig. 79


VFK0137
Post

Loosen this Hex Screw for Post Height Adj. After Adjustment, be sure to tighten it.

Fig. 80

3. Adjust the 2 screws (A) and the screw (B) so that the Audio/Control Head height becomes as shown below.

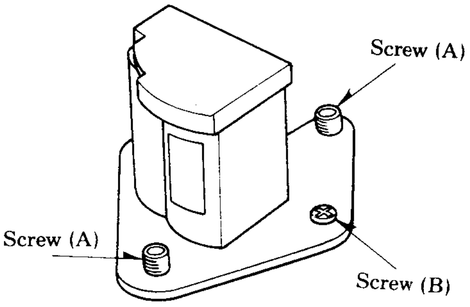

Screw (A)
Screw (A)
Screw (B)

Fig. 81

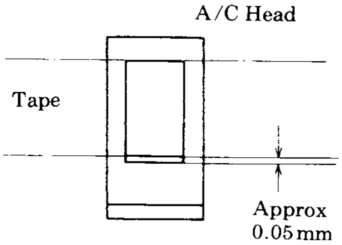

A/C Head
Tape
Approx
0.05 mm

Fig. 82

B. Tape Interchangeability Adjustment

- * Connect an oscilloscope to TP506 on the FM Mod. & Head Amp Board (VEP0536A1).
- * Playback the monoscope portion of the alignment tape VFM8100H3D.

B-1. Tape Crease and Slack Adjustment

1. Watch the portions between Post P_1 and A, and between Post P_2 and B carefully.
2. If tape crease or slack is appearing at these position, adjust the position of the inclined base.
   To adjust it, loosen the screw (A) slightly, set the eccentric screwdriver (VFK0135) to the hole (B) and move the base as shown.

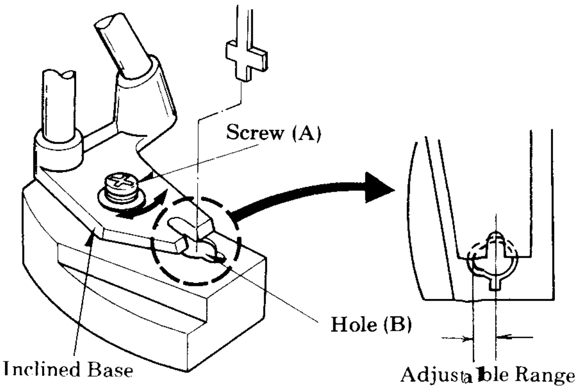

Screw (A)
Hole (B)
Inclined Base
Adjustable Range

Fig. 83

B-2. Post Height Adjustment

While playing back the monoscope portion of the alignment tape VFM8100H3D, adjust posts P_A, P_1 and P_2 by watching the scope display (Test Point: TP506 on the FM Mod. & Head Amp Board) so that the RF envelope on the scope becomes as flat as possible.
(V1/V≧0.7, V2/V≧0.7)

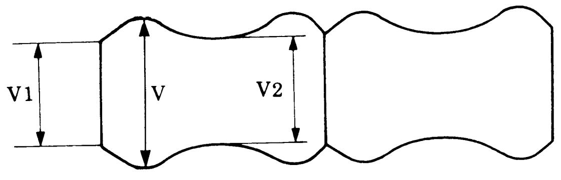
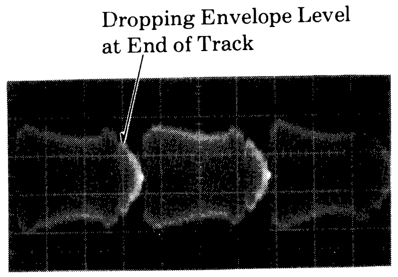
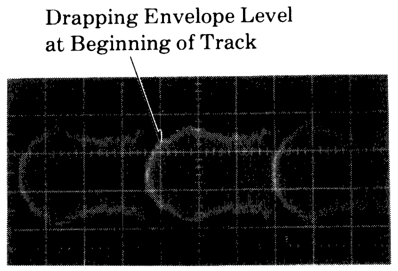


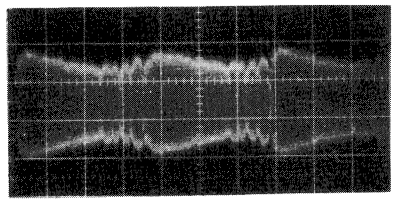
Fig. 84



No Good
Fig. 85



No Good
Fig. 86



Good
Fig. 87

B-3. Audio/Control Head Position Adjustment

1. Be sure to set the Tracking Control on the Top Panel to the center position. (Fix Position).
2. (A/C Head Tilt Adjustment).
   While playing back the monoscope portion of the alignment tape VFM8100H3D, adjust the hex screws (A) for the maximum RF envelope on the scope.

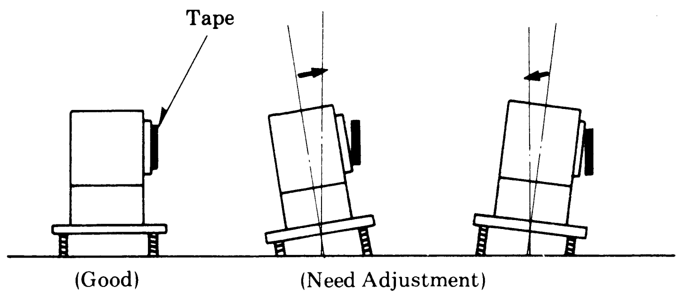


Fig. 88

3. (A/C Head Horizontal Position Adjustment).
   While playing back the monoscope portion of the alignment tape VFM8100H3D, loosen the 2 screws (A) and move the A/C Head horizontally for the maximum RF envelope on the scope.

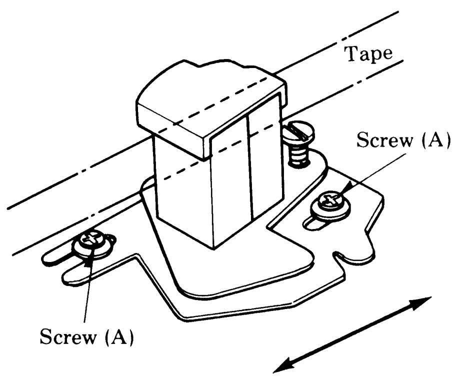
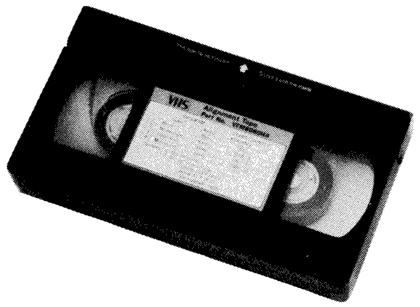
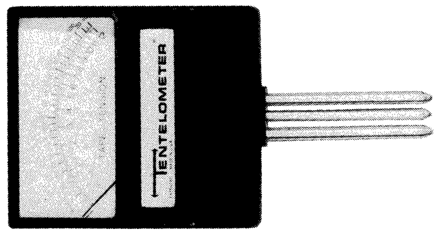
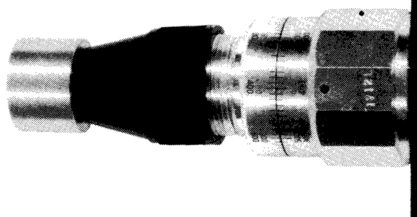
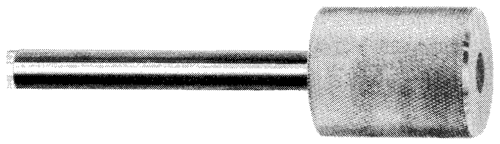
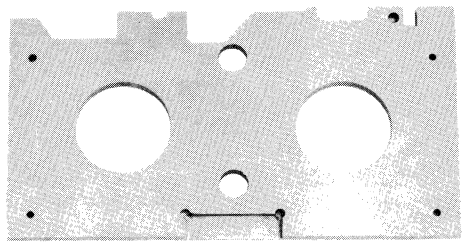
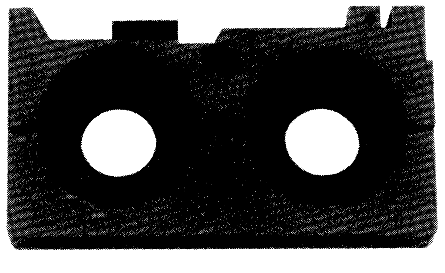
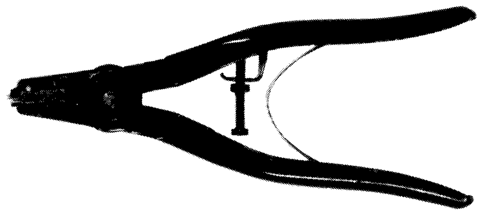
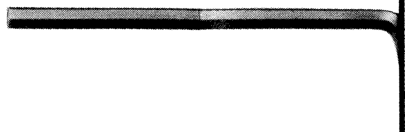
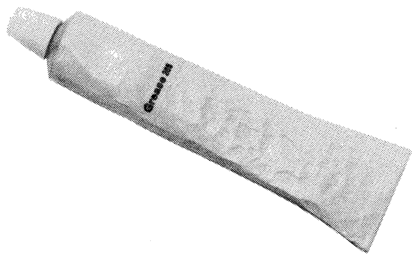
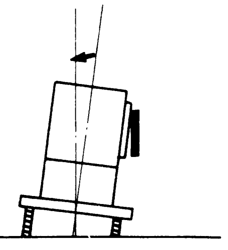


Fig. 89

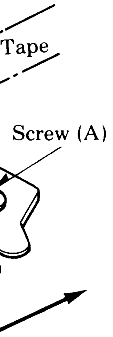
Servicing Jigs & To

VFM80100H3D **VHS Alignment Tape** 	**Back Tension Meter** **(Tentelometer, Made in U.S.A.)** 	**VFK0133** **Dial Torque Gau** **VFK0134** **Adaptor for VFK** 
VFK0137 **Post Adjustment Screwdriver** 	**VFK0138** **Post Adjustment Plate** 	**VFK0139** **Reel Table Heig**
VFK0142 **Cassette Holder Jig** 	**VFK0144** **Retaining Ring Remover (3mm)** **VFK0145** **Retaining Ring Remover (4mm)** 	**VFK0146** **Hex. Wrench (0.9** **VFK75** **Hex. Wrench (1.2** **VFK76** **Hex. Wrench (1.5** 
VFK66 **Fan-type Tension Gauge** 	**MOR265** **Morlytone Grease** 	



ent)

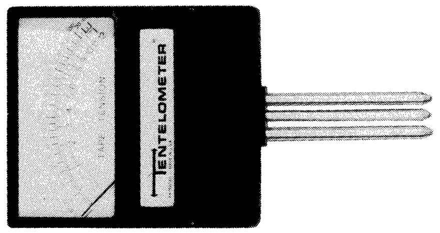
djustment).
scope portion of the
oosen the 2 screws (A)
tally for the maximum



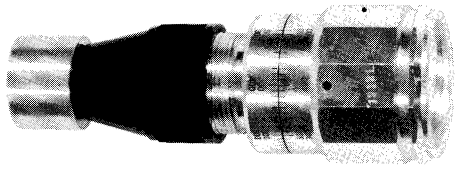
Servicing Jigs & Tools

VFM80100H3D VHS Alignment Tape

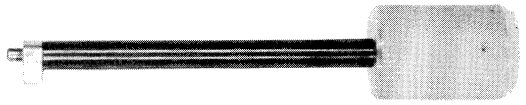
Back Tension Meter
(Tentelometer, Made in U.S.A.)



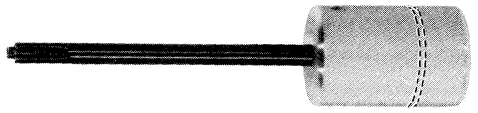
VFK0133 Dial Torque Gauge
VFK0134 Adaptor for VFK0133



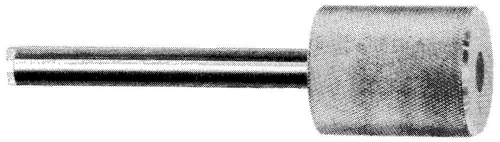
VFK0135 Eccentric Screwdriver



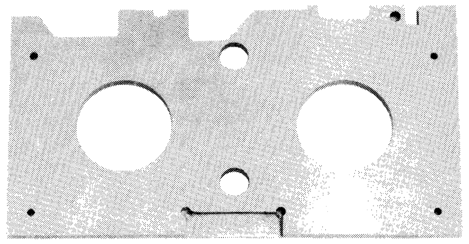
VFK0136 Fine Adjustment Screwdriver



VFK0137 Post Adjustment Screwdriver

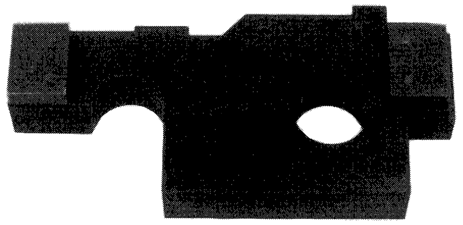


VFK0138 Post Adjustment Plate

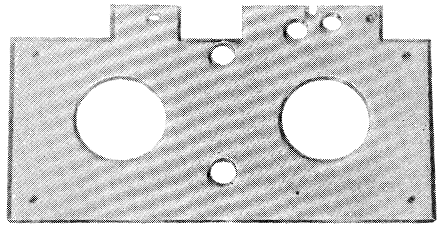


VFK0139 Reel Table Height Jig

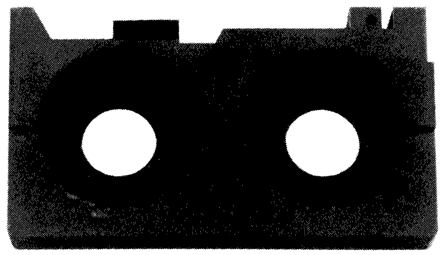
VFK0140 Cassette Lock Arm Adjustment Jig



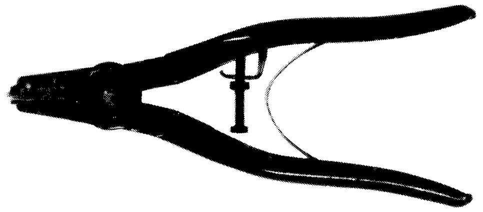
VFK0141 Capstan Reference Plate



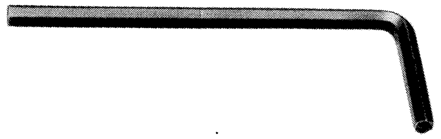
VFK0142 Cassette Holder Jig



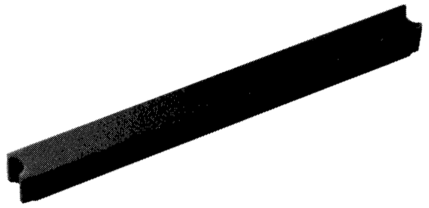
VFK0144 Retaining Ring Remover (3 mm)
VFK0145 Retaining Ring Remover (4 mm)



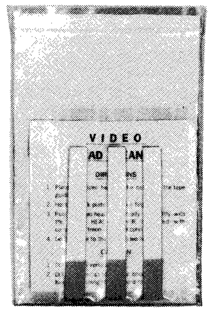
VFK0146 Hex. Wrench (0.9 mm)
VFK75 Hex. Wrench (1.25 mm)
VFK76 Hex. Wrench (1.5 mm)



VFK0148 Cassette Tape Holder

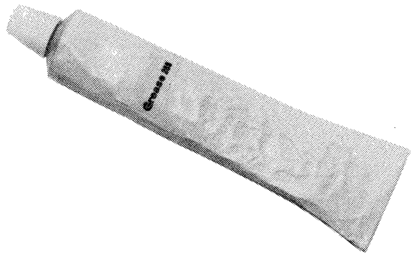


VFK27 Head Cleaning Stick



VFK66 Fan-type Tension Gauge

MOR265 Morlytone Grease



ORDER NO. VRD-7807-300

Service Manual

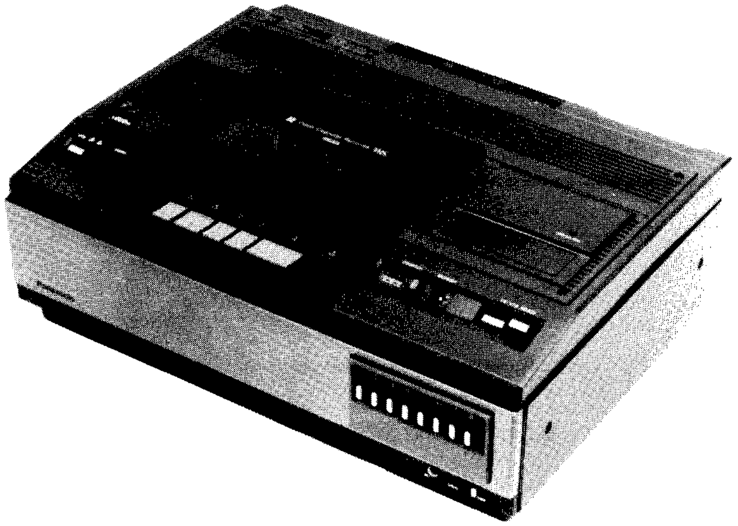
Video Cassette Recorder

Panasonic VHS™

Vol. 3

NV-8600-E -B

Block Diagrams
Schematic Diagrams



SPECIFICATIONS

NV-8600-E (EUROPE)
NV-8600-B (ENGLAND)

Power Source:	220, 240 V AC, 50 Hz/60 Hz
Power Consumption:	Approx. 30 watts
Television System:	CCIR: 625 lines, 50 fields PAL colour signal
Video Recording System:	2 rotary heads, helical scanning system Luminance: FM azimuth recording Colour signal: converted subcarrier phase shift recording
Audio Track:	1 track
Tape Format:	Tape width 12.7 mm high density tape
Tape Speed:	23.39 mm/s
Record/Playback Time:	180 min. with NV-E180
FF/REW Time:	Less than 4.5 min. with NV-E180
Heads:	Video: 2 rotary heads Audio/Control: 1 stationary head Erase: 1 full track erase
Input Level:	Video: VIDEO IN jack 1.0 Vp-p, 75 ohm unbalanced Audio: MIN IN jack −70 dB, 600 ohm unbalanced LINE IN jack −20 dB, 100 kohm unbalanced

Output Level:	Video: VIDEO OUT jack 1.0 Vp-p, 75 ohm unbalanced Audio: LINE OUT jack −6 dB, 600 ohm unbalanced RF Modulated: UHF channel 45 (±2) 73 dB (open voltage), 75 ohm unbalanced
Weight:	17.0 kg
Dimensions:	485(W) × 368(D) × 176(H) mm
Accessories Supplied:	1 pc. Video cassette tape, NV-E120 1 pc. DIN-DIN coaxial cable, VJA0116 1 pc. Dust cover, VYC0028 1 pc. Remote pause control, NV-A181 Approx. 6 m
Optional Accessories:	Video cassette tape: NV-E180 Approx. 258 m, 180 min. NV-E120 Approx. 174 m, 120 min. NV-E60 Approx. 88 m, 60 min. Video camera, WV-460/E Microphone

Weight and dimensions shown are approximate.
Specifications are subject to change without notice.

Panasonic

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

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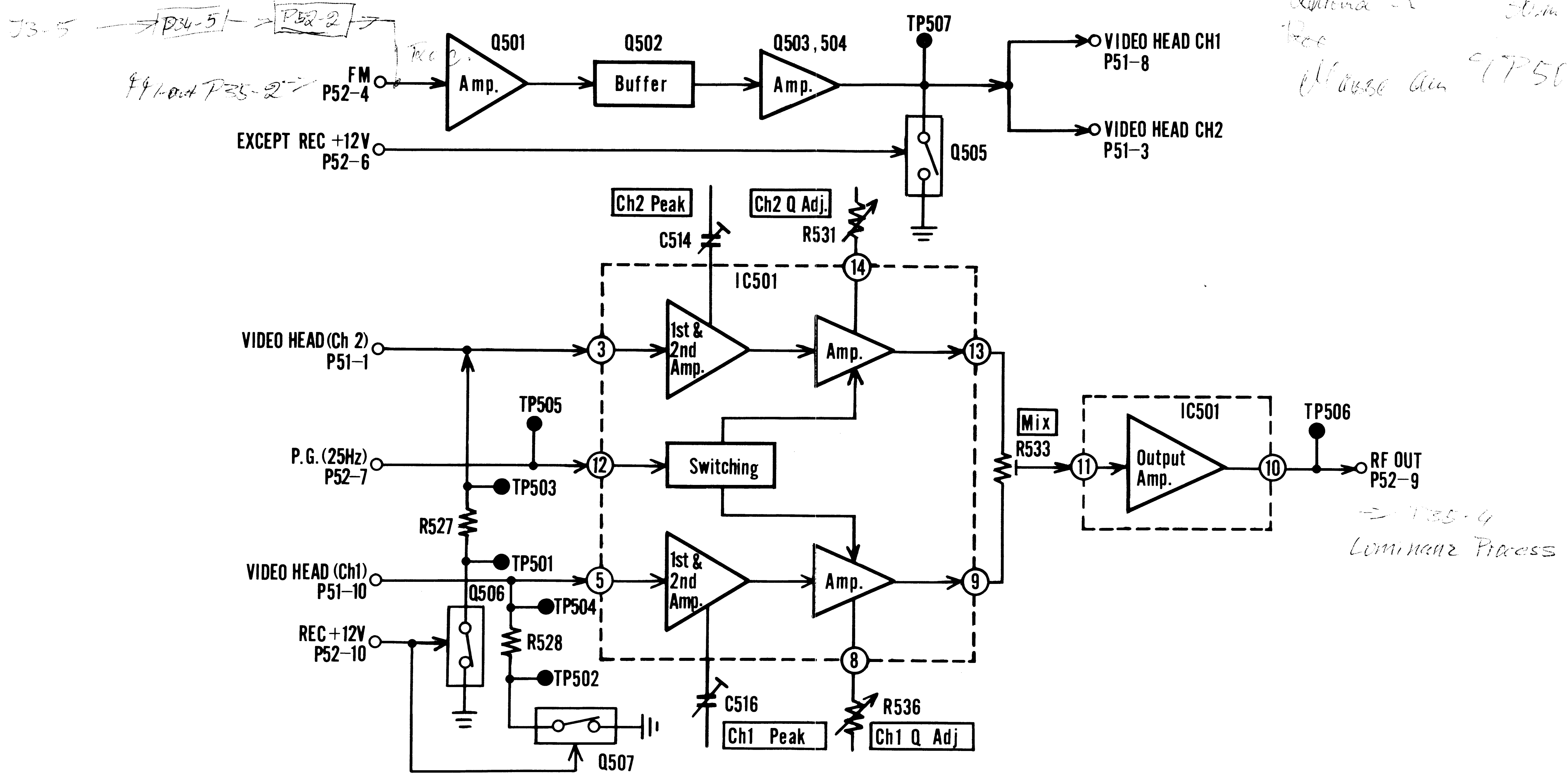
REC & HEAD AMP BLOCK DIAGRAM



Q501
Amp.
Q502
Buffer
Q503, 504
Amp.
TP507
VIDEO HEAD CH1
P51-8
VIDEO HEAD CH2
P51-3
FM
P52-4
EXCEPT REC +12V
P52-6
Q505
Ch2 Peak
C514
Ch2 Q Adj.
R531
14
IC501
VIDEO HEAD (Ch 2)
P51-1
3
1st & 2nd Amp.
Amp.
13
TP505
P.G. (25Hz)
P52-7
12
Switching
Mix
R533
11
IC501
Output Amp.
10
TP506
RF OUT
P52-9
TP503
R527
TP501
VIDEO HEAD (Ch1)
P51-10
5
1st & 2nd Amp.
Amp.
9
Q506
TP504
REC +12V
P52-10
R528
TP502
8
C516
Ch1 Peak
R536
Ch1 Q Adj
Q507

J3-5 → P34-5 → P52-2 →

Rec

F4-out P35-2 →

Rec. Current (V) 1.1 Vss

Camera - 1 30mVss TP5..

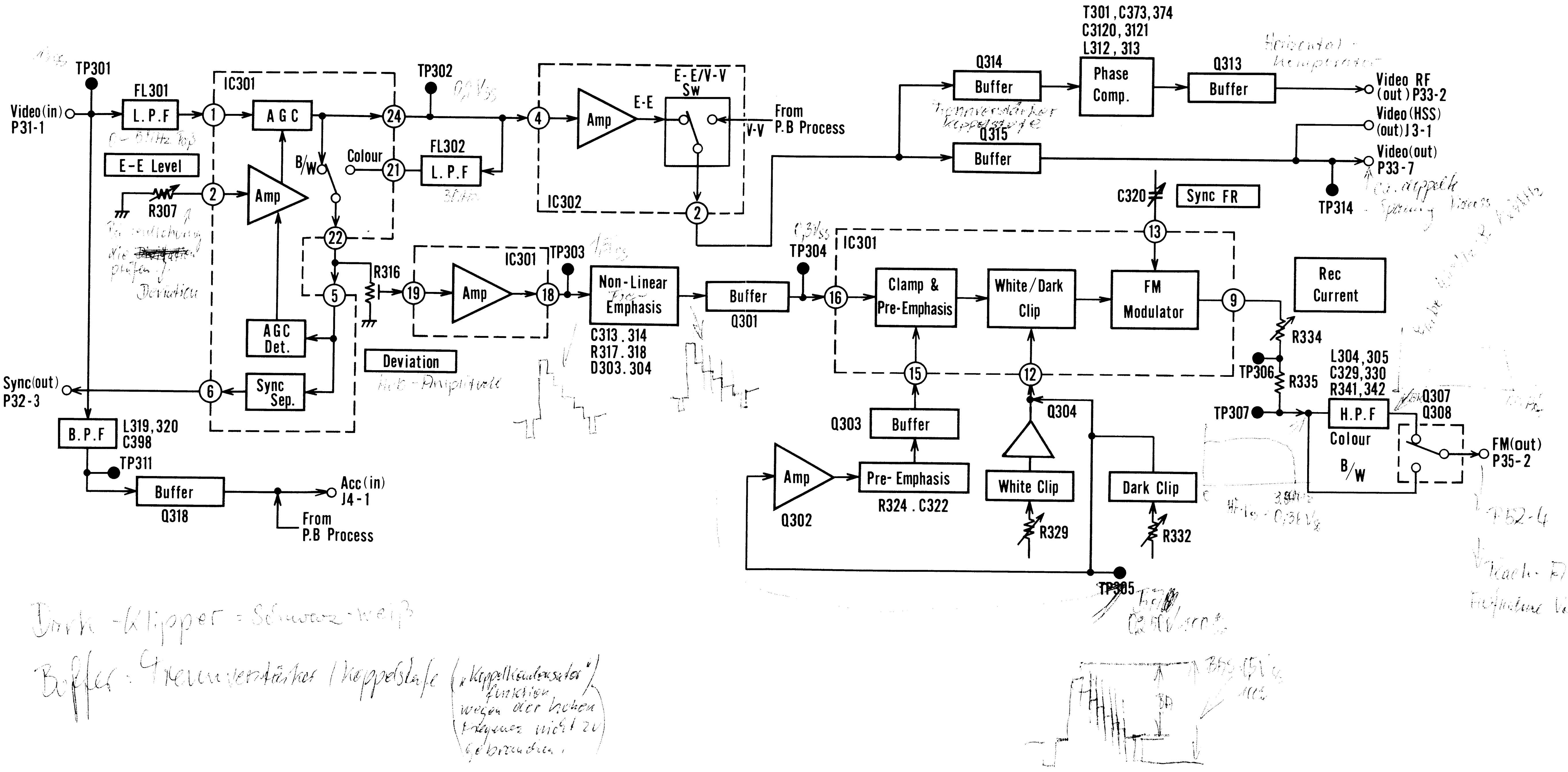
Rec

Measure an TP502

⇒ P35-4

Luminanz Process

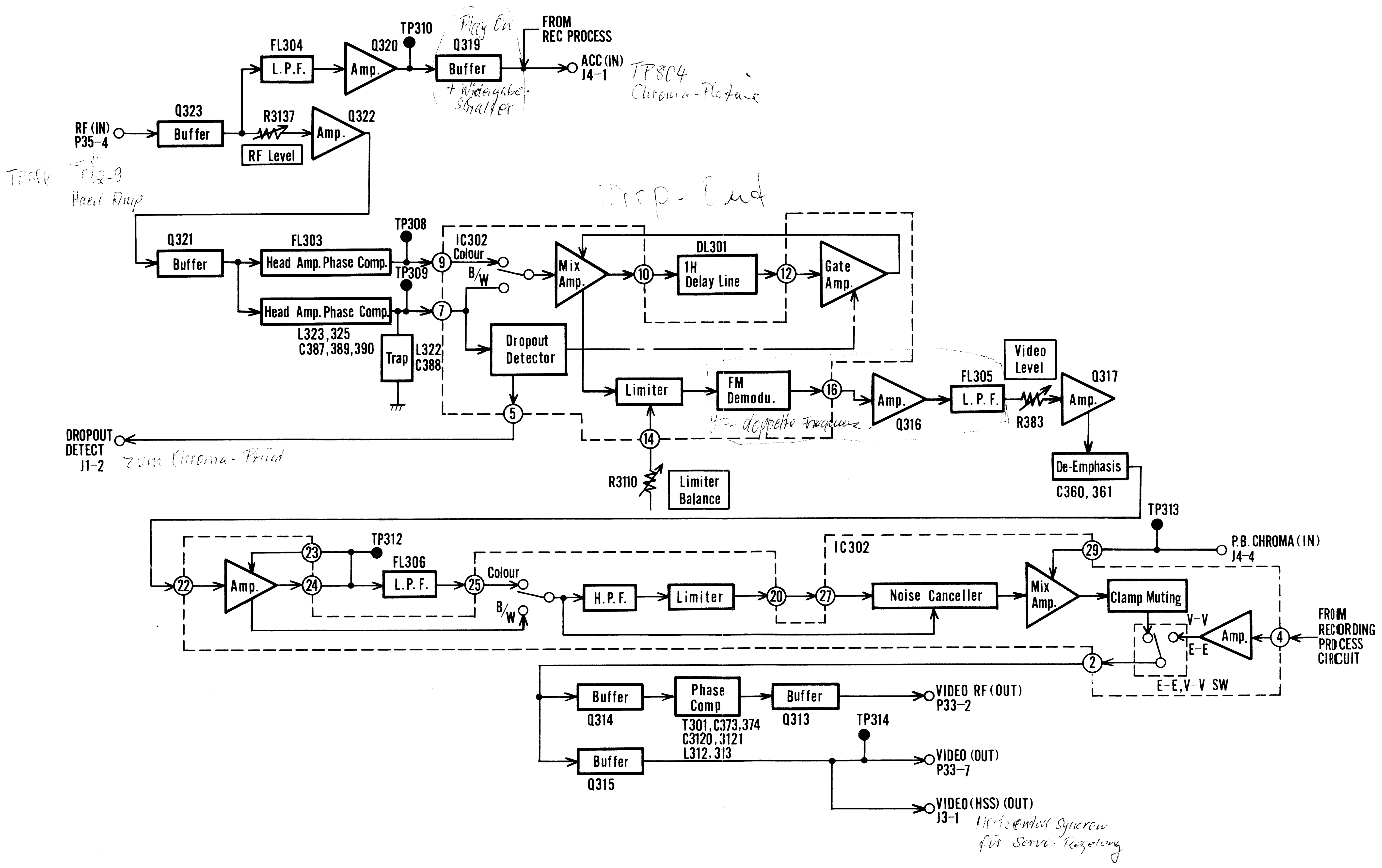
LUMINANCE RECORDING PROCESS BLOCK DIAGRAM


TP301
Video(in)
P31-1
FL301
L.P.F
E-E Level
R307
IC301
AGC
Amp
AGC Det.
Sync Sep.
Sync(out)
P32-3
B/W
Colour
TP302
FL302
L.P.F
R316
Amp
Deviation
IC301
TP303
Non-Linear Pre-Emphasis
C313.314
R317.318
D303.304
Buffer
Q301
E-E
E-E/V-V Sw
V-V
From P.B Process
IC302
TP304
IC301
Clamp & Pre-Emphasis
White/Dark Clip
FM Modulator
C320
Sync FR
Q314
Buffer
T301, C373, 374
C3120, 3121
L312, 313
Phase Comp.
Q313
Buffer
Video RF (out) P33-2
Video(HSS) (out) J3-1
Q315
Buffer
Video(out) P33-7
TP314
Rec Current
R334
TP306
R335
L304, 305
C329, 330
R341, 342
TP307
H.P.F
Colour
B/W
Q307
Q308
FM(out)
P35-2
Q303
Buffer
Amp
Q302
Pre-Emphasis
R324.C322
White Clip
R329
Q304
Dark Clip
R332
TP305
B.P.F
L319, 320
C398
TP311
Buffer
Q318
Acc(in)
J4-1
From P.B Process
1
2
24
21
22
5
6
19
18
4
2
16
13
9
15
12
C-Blitz-Top
0,2 Vss
30 kHz
1 Vss
0,3 Vss
Deviation
Amplitude
Trennverstärker Koppelstufe
Hochfrequenz-Komparator
Trennverstärker
3,5 MHz
Hub = 0,36 Vss
P32-4
Carrier

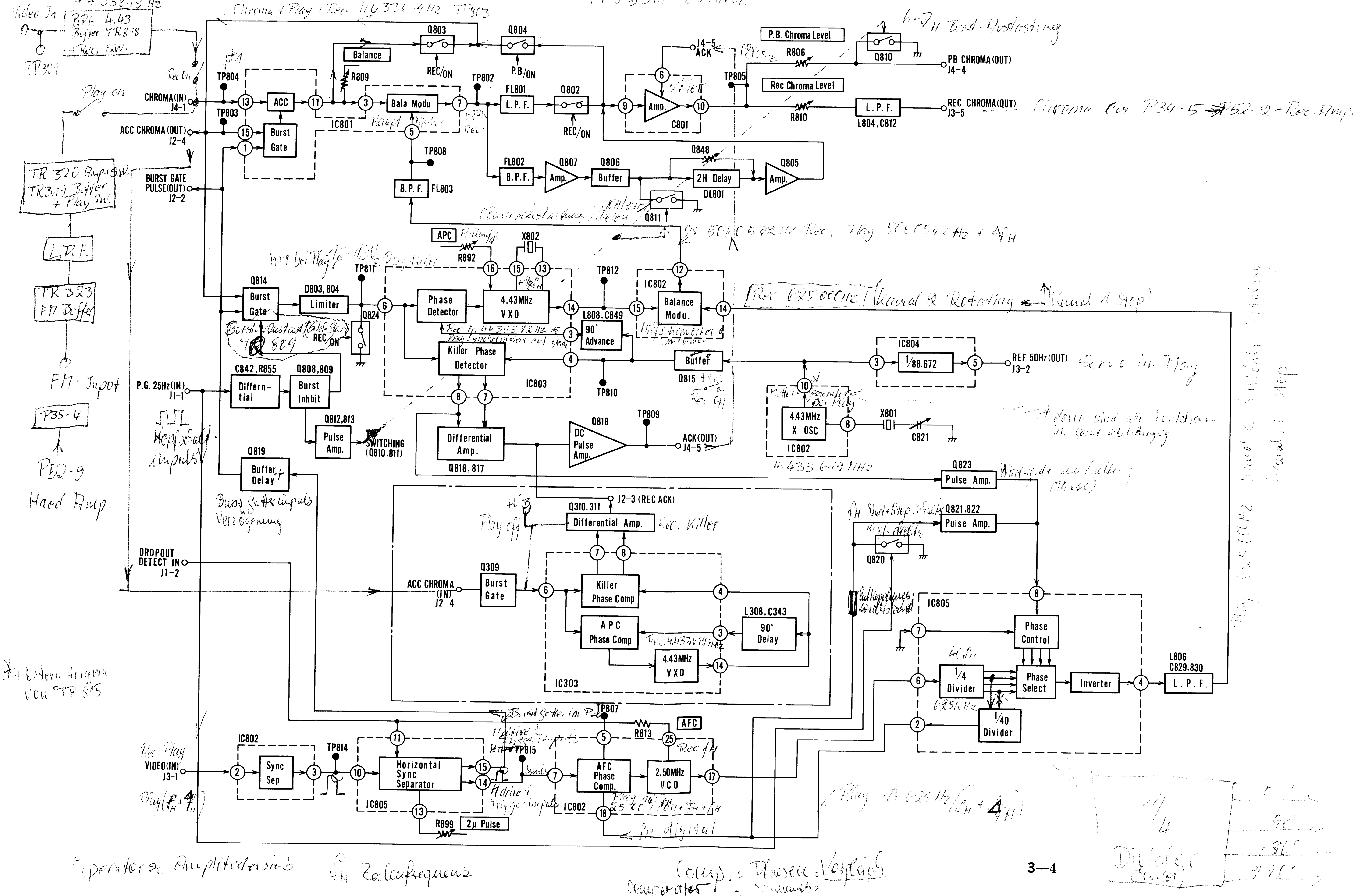
Dark-Klipper = Schwarz-weiß

Buffer: Trennverstärker / Koppelstufe („Koppelkondensator" Funktion wegen der hohen Frequenz nicht zu gebrauchen.)

LUMINANCE PLAYBACK PROCESS BLOCK DIAGRAM

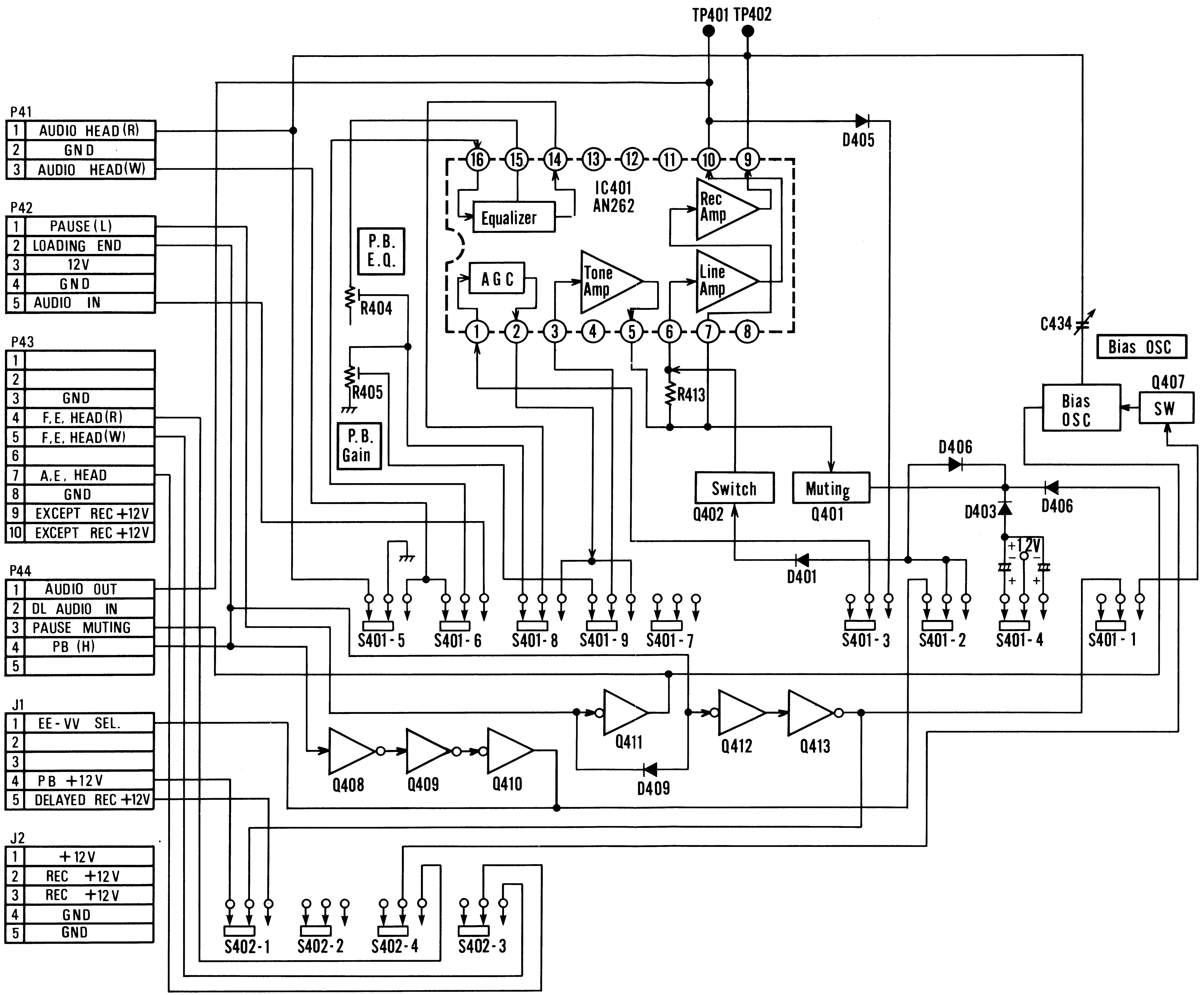

RF (IN)
P35-4
Q323
Buffer
R3137
RF Level
Q322
Amp.
FL304
L.P.F.
Q320
Amp.
TP310
Play On
Q319
Buffer
+ Widergabe-Schalter
FROM REC PROCESS
ACC (IN)
J4-1
TP804
Chroma-Platine
TP806 TP2-9
Head Amp
Drop-Out
Q321
Buffer
FL303
Head Amp. Phase Comp.
TP308
TP309
Head Amp. Phase Comp.
L323, 325
C387, 389, 390
Trap
L322
C388
IC302
Colour
B/W
9
7
Dropout Detector
5
Mix Amp.
10
DL301
1H Delay Line
12
Gate Amp.
Limiter
14
R3110
Limiter Balance
FM Demodu.
doppelte Frequenz
16
Amp.
Q316
FL305
L.P.F.
Video Level
R383
Q317
Amp.
De-Emphasis
C360, 361
DROPOUT DETECT
J1-2
zum Chroma-Print
TP313
P.B. CHROMA (IN)
J4-4
22
Amp.
23
24
TP312
FL306
L.P.F.
25
Colour
B/W
H.P.F.
Limiter
20
27
IC302
Noise Canceller
29
Mix Amp.
Clamp Muting
V-V
E-E
Amp.
4
FROM RECORDING PROCESS CIRCUIT
2
E-E, V-V SW
Buffer
Q314
Phase Comp
T301, C373, 374
C3120, 3121
L312, 313
Buffer
Q313
VIDEO RF (OUT)
P33-2
TP314
Buffer
Q315
VIDEO (OUT)
P33-7
VIDEO (HSS) (OUT)
J3-1
Horizontal Synchron für Servo-Regelung

COLOUR PROCESS BLOCK DIAGRAM

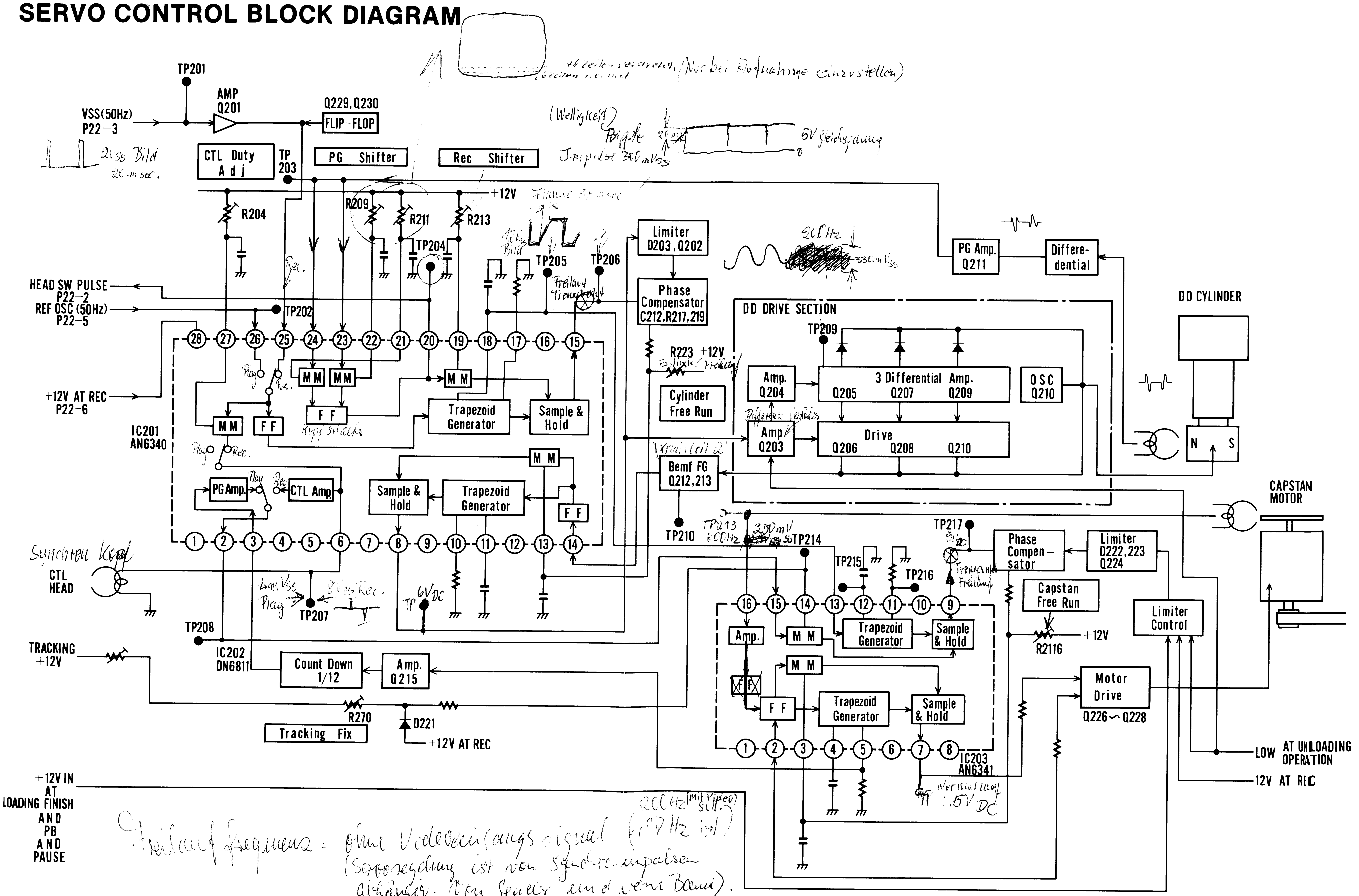


Video In
BPF 4.43 Buffer TR818 + Rec. Sw.
4433619 Hz
TP301
Chroma + Play + Rec 4433619 Hz TP803
Rec On
Play on
TR 320 Amp + SW.
TR319 Buffer + Play SW.
L.P.F.
TR 323 FM Buffer
FM-Input
P35-4
P52-9
Head Amp.
CHROMA (IN) J4-1
ACC CHROMA (OUT) J2-4
BURST GATE PULSE (OUT) J2-2
TP804
TP803
ACC
Burst Gate
IC801
Balance
R809
Q803
REC/ON
Bala Modu
TP802
Q804
P.B./ON
FL801
L.P.F.
Q802
REC/ON
TP808
B.P.F.
FL803
FL802
B.P.F.
Q807
Amp.
Q806
Buffer
Q848
2H Delay
DL801
Q811
Q805
Amp.
J4-5 ACK
Amp.
IC801
TP805
P.B. Chroma Level
R806
Q810
PB CHROMA (OUT) J4-4
Rec Chroma Level
R810
L.P.F.
L804, C812
REC CHROMA (OUT) J3-5
Chroma Out P34-5 → P52-2 - Rec Amp.
6-7 H Burst-Austastung
APC
R892
X802
TP812
TP811
Q814
Burst Gate
D803, 804
Limiter
Q824
REC/ON
Phase Detector
4.43MHz VXO
L808, C849
90° Advance
Killer Phase Detector
IC803
TP810
IC802
Balance Modu.
Buffer
Q815
Rec 625 00 Hz / Kanal 2 Rotating ← Kanal 1 Stop
IC804
1/88.672
REF 50Hz (OUT) J3-2
Servo in Play
4.43MHz X-OSC
IC802
X801
C821
4433619 Hz
P.G. 25Hz (IN) J1-1
C842, R855
Differn-tial
Q808, 809
Burst Inhbit
Q812, 813
Pulse Amp.
SWITCHING (Q810, 811)
Kopfschalt-impuls
Differential Amp.
Q816, 817
Q818
DC Pulse Amp.
TP809
ACK (OUT) J4-5
Q819
Buffer + Delay
Burst Gatterimpuls Verzögerung
Q823
Pulse Amp.
Q310, 311
J2-3 (REC ACK)
Differential Amp.
Rec. Killer
Play off
Q821, 822
Pulse Amp.
Q820
DROPOUT DETECT IN J1-2
Q309
ACC CHROMA (IN) J2-4
Burst Gate
Killer Phase Comp
APC Phase Comp
L308, C343
90° Delay
4.43MHz VXO
IC303
IC805
Phase Control
1/4 Divider
625 kHz
Phase Select
Inverter
1/40 Divider
L806 C829, 830
L.P.F.
Extern triggern von TP815
TP807
R813
AFC
IC802
TP814
Sync Sep
Horizontal Sync Separator
IC805
TP815
H-drive Trigger-impuls
AFC Phase Comp.
2.50MHz VCO
IC802
R899
2μ Pulse
Rec. Play VIDEO (IN) J3-1
Play 4 × 625 Hz (fH + 1/4 fH)
fH digital
1/4 Divider
90°
180°
270°
Separator = Amplitudensieb
fH Zeilenfrequenz
Comp. = Phasen-Vergleich
Comparator

AUDIO BLOCK DIAGRAM


TP401
TP402
P41
1 AUDIO HEAD (R)
2 GND
3 AUDIO HEAD (W)
P42
1 PAUSE (L)
2 LOADING END
3 12V
4 GND
5 AUDIO IN
P43
1
2
3 GND
4 F.E. HEAD (R)
5 F.E. HEAD (W)
6
7 A.E. HEAD
8 GND
9 EXCEPT REC +12V
10 EXCEPT REC +12V
P44
1 AUDIO OUT
2 DL AUDIO IN
3 PAUSE MUTING
4 PB (H)
5
J1
1 EE-VV SEL.
2
3
4 PB +12V
5 DELAYED REC +12V
J2
1 +12V
2 REC +12V
3 REC +12V
4 GND
5 GND
IC401
AN262
Equalizer
AGC
Tone Amp
Rec Amp
Line Amp
16
15
14
13
12
11
10
9
1
2
3
4
5
6
7
8
P.B. E.Q.
R404
R405
P.B. Gain
R413
D405
C434
Bias OSC
Bias OSC
Q407
SW
D406
D406
D403
+12V
Switch
Q402
Muting
Q401
D401
S401-5
S401-6
S401-8
S401-9
S401-7
S401-3
S401-2
S401-4
S401-1
Q411
Q412
Q413
D409
Q408
Q409
Q410
S402-1
S402-2
S402-4
S402-3

SERVO CONTROL BLOCK DIAGRAM

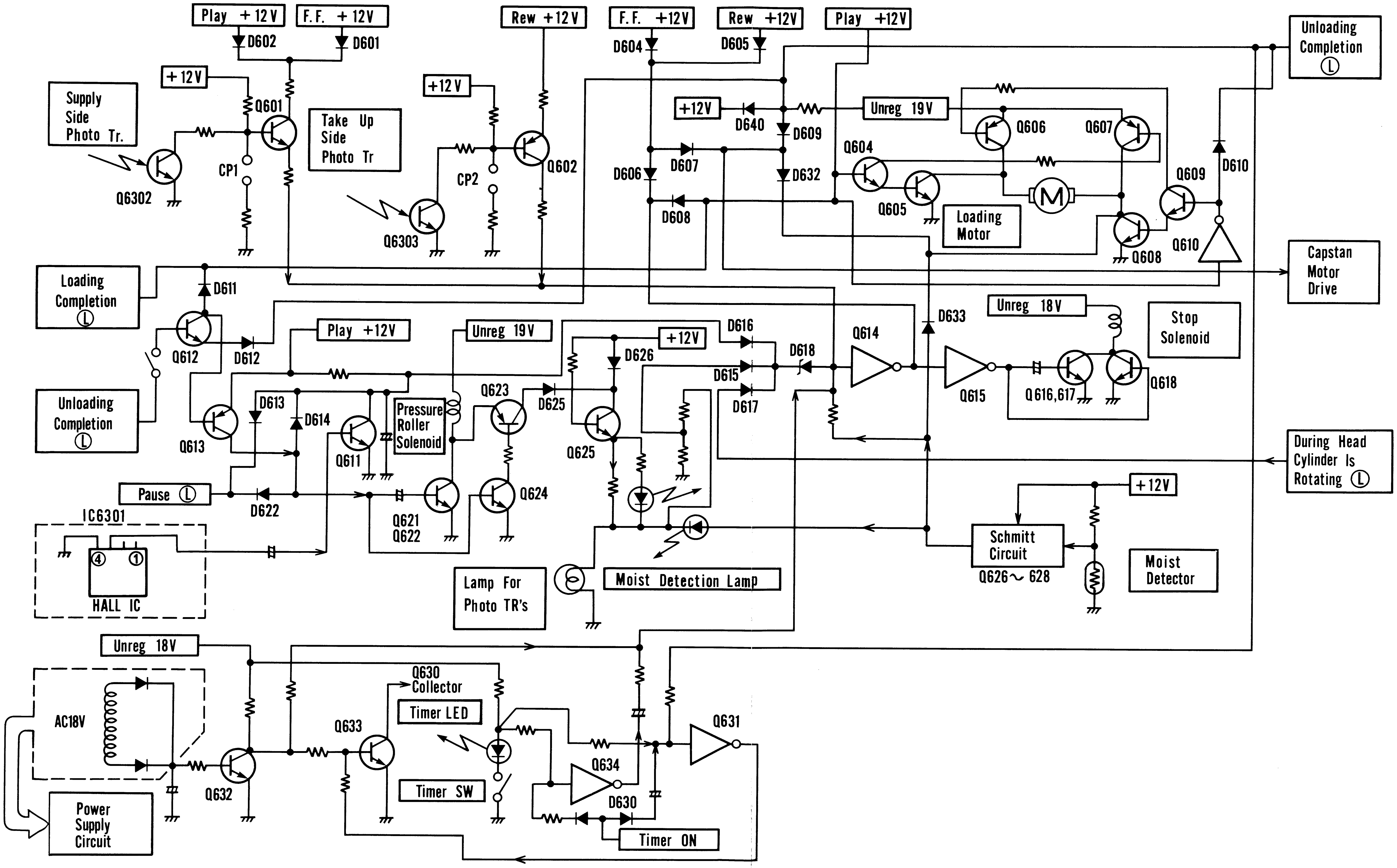

ab Zeilen verrauscht, 6 Zeilen normal (Nur bei Aufnahme einstellen)
TP201
AMP Q201
VSS(50Hz) P22—3
2 Vss Bild 20 msec.
Q229,Q230 FLIP-FLOP
CTL Duty Adj
TP 203
PG Shifter
Rec Shifter
(Welligkeit) Ripple
20 mV
Impulse 300 mVss
5V Gleichspannung
+12V
Flanke 3 msec
R204
R209
R211
R213
TP204
Rec.
10 Vss Bild
TP205
TP206
Freilauf Trennpunkt
Limiter D203,Q202
Phase Compensator C212,R217,219
20 Hz
330 mVss
PG Amp. Q211
Differe-dential
DD CYLINDER
HEAD SW PULSE P22—2
REF OSC (50Hz) P22—5
TP202
DD DRIVE SECTION
TP209
R223 +12V
Festwert Freilauf
Amp. Q204
3 Differential Amp. Q205 Q207 Q209
OSC Q210
+12V AT REC P22—6
MM
Play
Rec.
Cylinder Free Run
Amp Q203
Differenz Verstärker
Drive Q206 Q208 Q210
N S
IC201 AN6340
MM
FF
F F
Trapezoid Generator
Sample & Hold
Kipp Schaltung
Freilauf 2
Bemf FG Q212,213
PG Amp.
CTL Amp
Sample & Hold
Trapezoid Generator
MM
FF
CAPSTAN MOTOR
TP210
TP213 600 Hz
250 mV
TP214
TP217
5V DC
Phase Compen-sator
Limiter Q222,223 Q224
Trennpunkt Freilauf
Synchron Kopf
CTL HEAD
2 mVss Play
3 Vss Rec.
TP207
TP 6V DC
TP215
TP216
Capstan Free Run
R2116
+12V
Limiter Control
TP208
TRACKING +12V
IC202 DN6811
Count Down 1/12
Amp. Q215
Amp.
MM
Trapezoid Generator
Sample & Hold
FF
Trapezoid Generator
Sample & Hold
Motor Drive Q226～Q228
R270
D221
+12V AT REC
Tracking Fix
IC203 AN6341
Normallauf 1.5V DC
200 Hz (mit Video Sch.)
LOW AT UNLOADING OPERATION
12V AT REC
+12V IN AT LOADING FINISH AND PB AND PAUSE

Freilauf frequenz = ohne Videoeingangssignal (157 Hz ist) (Servoregelung ist von Synchronimpulsen abhängig. Von Sender und vom Band).

MM = Monostabiler Flip-Flop

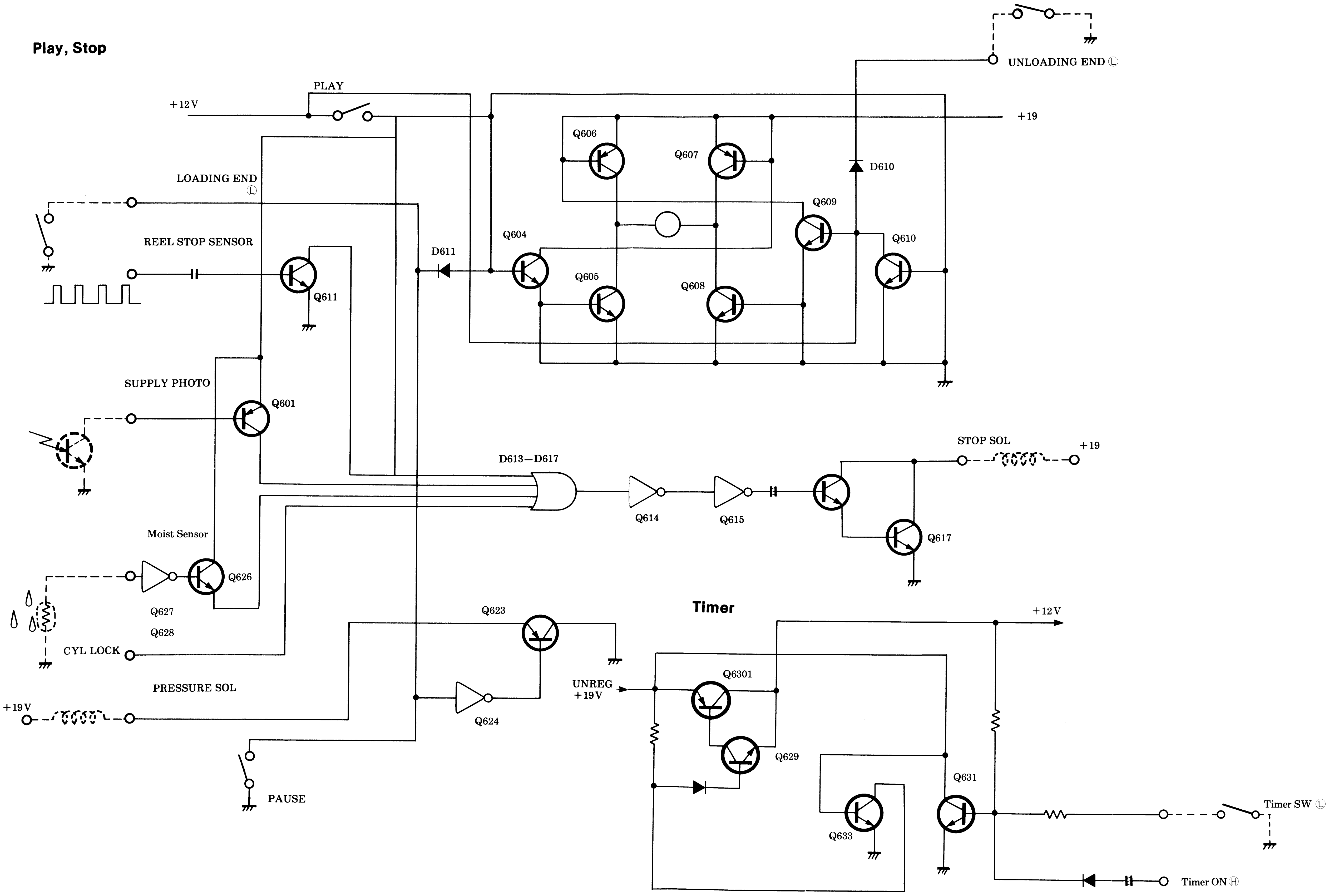
Standbild Q 312
Emitter + Basis kurzschließen

TRANSPORT BLOCK DIAGRAM


Play +12V
F.F. +12V
D602
D601
+12V
Supply Side Photo Tr.
Q601
CP1
Q6302
Take Up Side Photo Tr
+12V
Rew +12V
CP2
Q602
Q6303
F.F. +12V
Rew +12V
Play +12V
D604
D605
+12V
D640
Unreg 19V
D609
D606
D607
D632
D608
Q604
Q605
Q606
Q607
Loading Motor
M
Q608
Q609
Q610
D610
Unloading Completion Ⓛ
Capstan Motor Drive
Loading Completion Ⓛ
D611
Q612
D612
Unloading Completion Ⓛ
Q613
D613
D614
Play +12V
Unreg 19V
Q611
Pressure Roller Solenoid
Q623
D625
+12V
D616
D626
D615
D617
D618
Q625
Q614
D633
Unreg 18V
Q615
Q616,617
Q618
Stop Solenoid
During Head Cylinder Is Rotating Ⓛ
Pause Ⓛ
D622
Q621
Q622
Q624
+12V
Schmitt Circuit
Q626～628
Moist Detector
IC6301
④
①
HALL IC
Lamp For Photo TR's
Moist Detection Lamp
Unreg 18V
AC18V
Power Supply Circuit
Q632
Q633
Q630 Collector
Timer LED
Timer SW
Q634
D630
Timer ON
Q631

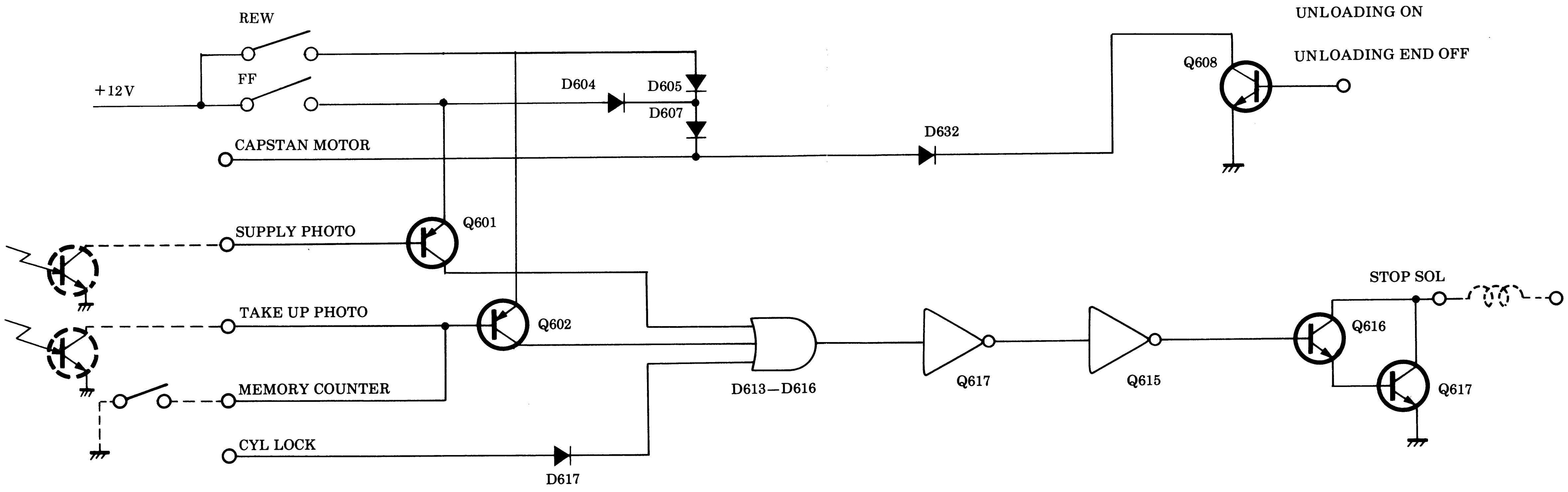
TRANSPORT BLOCK DIAGRAM

Play, Stop

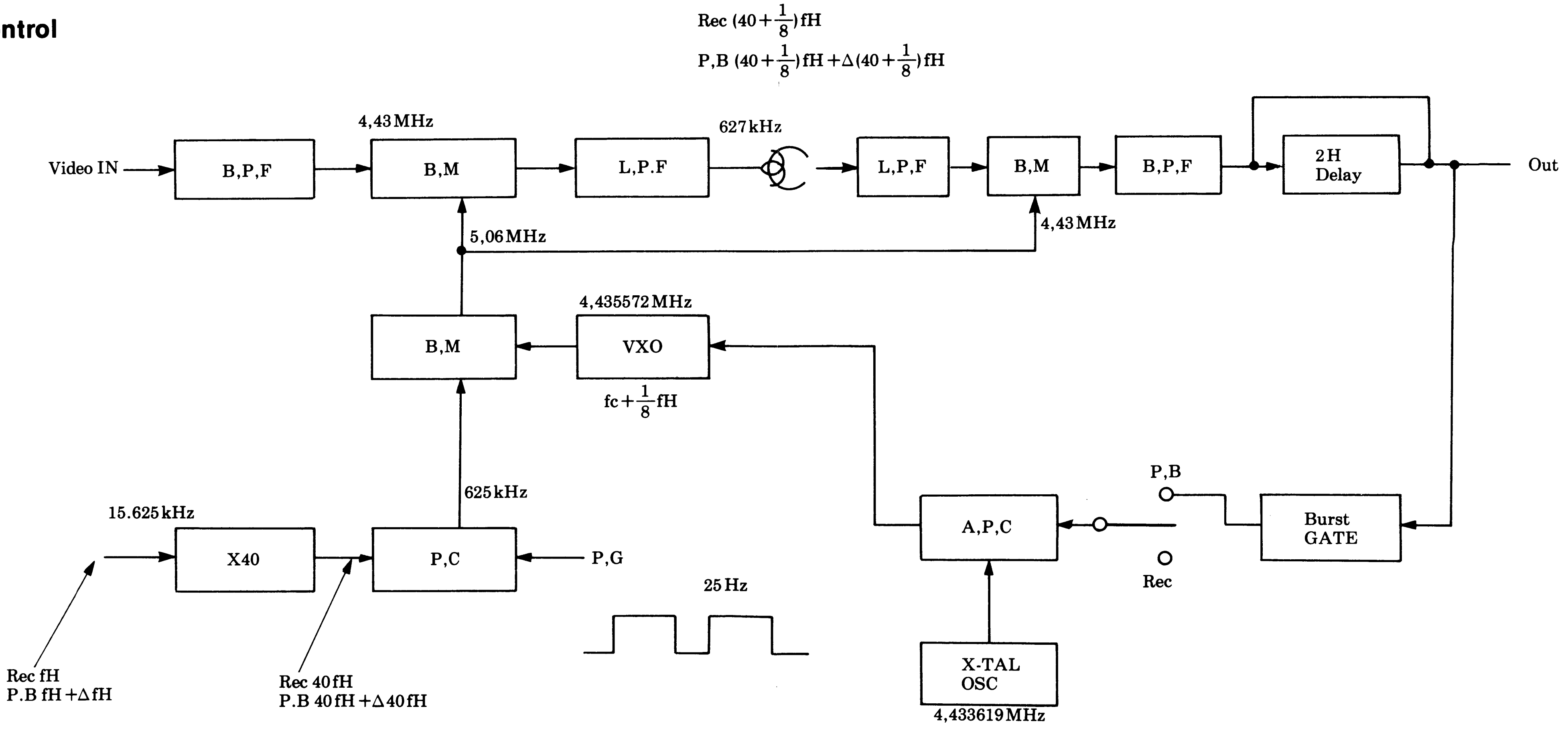

UNLOADING END Ⓛ
+19
PLAY
+12V
Q606
Q607
D610
LOADING END Ⓛ
Q609
REEL STOP SENSOR
Q604
Q610
D611
Q605
Q608
Q611
SUPPLY PHOTO
Q601
STOP SOL
+19
D613—D617
Q614
Q615
Q617
Moist Sensor
Q626
Q627
Q628
CYL LOCK
Timer
Q623
+12V
PRESSURE SOL
UNREG
+19V
Q6301
+19V
Q624
Q629
PAUSE
Q631
Timer SW Ⓛ
Q633
Timer ON Ⓗ

TRANSPORT BLOCK DIAGRAM

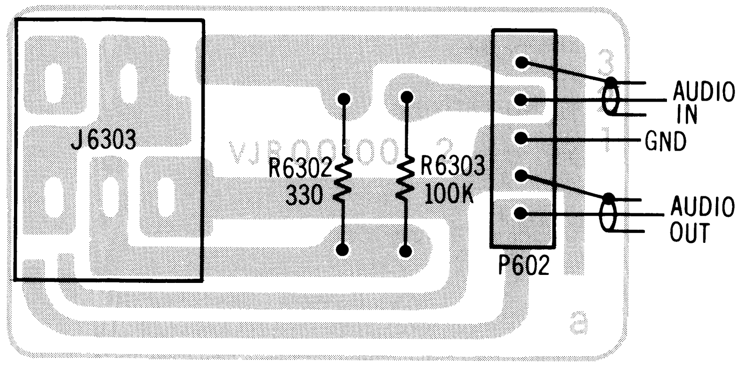
F.F, Rew


REW
FF
+12V
D604
D605
D607
CAPSTAN MOTOR
D632
Q608
UNLOADING ON
UNLOADING END OFF
SUPPLY PHOTO
Q601
TAKE UP PHOTO
Q602
MEMORY COUNTER
D613—D616
Q617
Q615
STOP SOL
Q616
Q617
CYL LOCK
D617

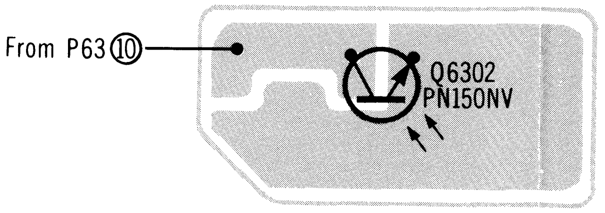
Frequency Control


Rec (40+$\frac{1}{8}$)fH
P,B (40+$\frac{1}{8}$)fH+Δ(40+$\frac{1}{8}$)fH
Video IN
B,P,F
4,43MHz
B,M
L,P.F
627kHz
L,P,F
B,M
B,P,F
2H Delay
Out
4,43MHz
5,06MHz
4,435572MHz
B,M
VXO
fc+$\frac{1}{8}$fH
P,B
Rec
A,P,C
Burst GATE
625kHz
15.625kHz
X40
P,C
P,G
25Hz
X-TAL OSC
4,433619MHz
Rec fH
P.B fH+ΔfH
Rec 40fH
P.B 40fH+Δ40fH

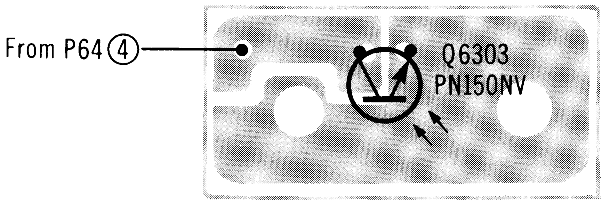
MIC JACK CIRCUIT BOARD (VJB00100)


J6303
R6302
330
R6303
100K
P602
AUDIO
IN
GND
AUDIO
OUT
VJB00100

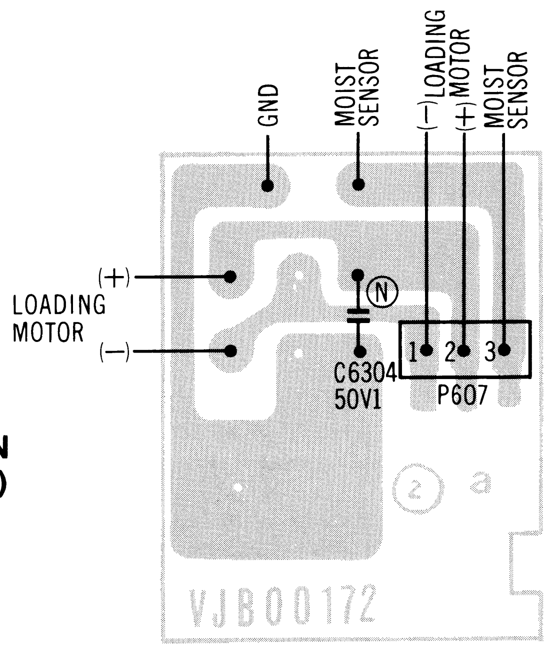
SUPPLY SENSOR CIRCUIT BOARD (VJB00132)


From P63⑩
Q6302
PN150NV

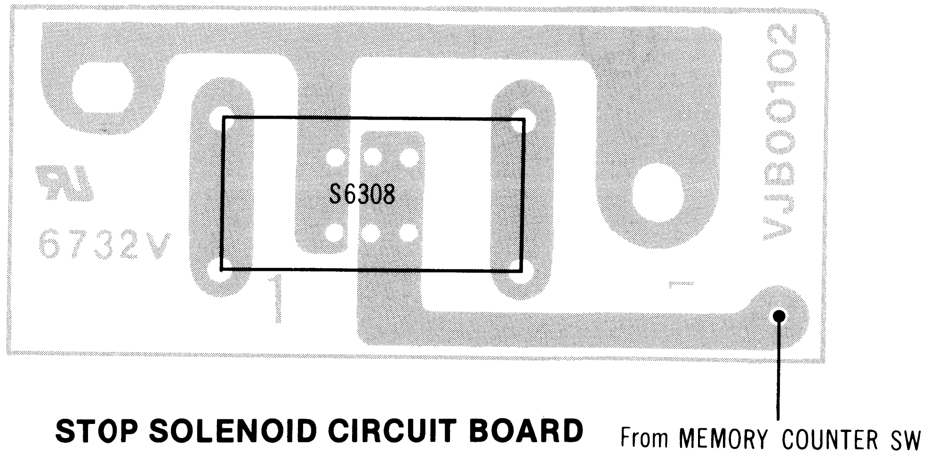
TAKE UP SENSOR CIRCUIT BOARD (VJB00183)


From P64④
Q6303
PN150NV

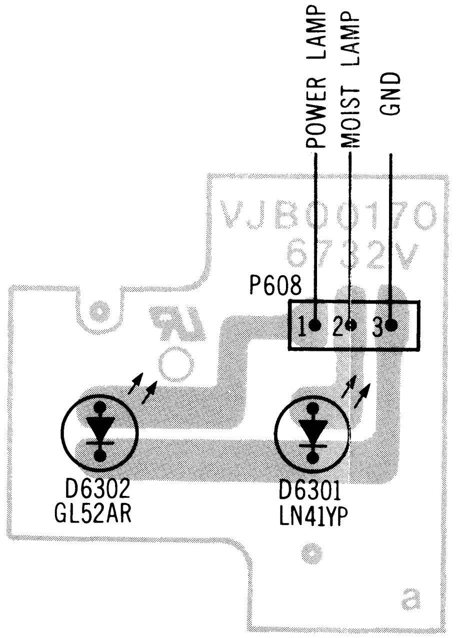
LOADING MOTOR CIRCUIT BOARD (VJB00172)


GND
MOIST SENSOR
(−) LOADING
(+) MOTOR
MOIST SENSOR
(+)
LOADING
MOTOR
(−)
Ⓝ
C6304
50V1
1
2
3
P607
VJB00172

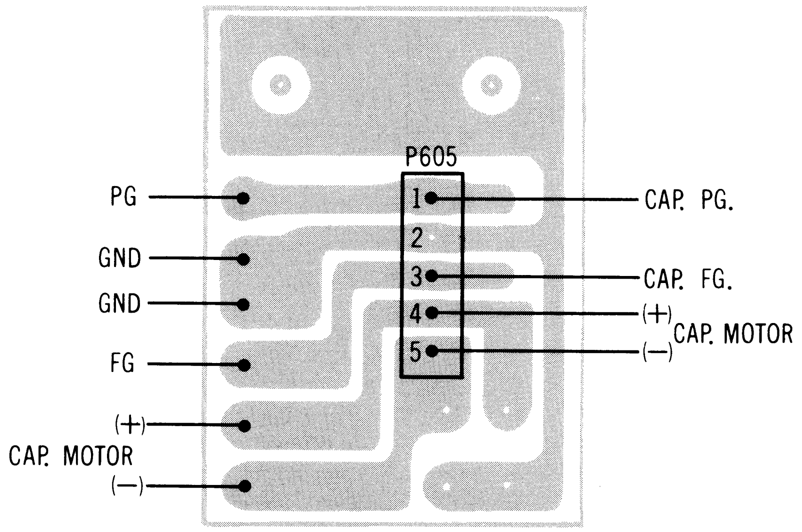
MEMORY COUNTER CIRCUIT BOARD (VJB00102)


S6308
6732V
VJB00102
From MEMORY COUNTER SW

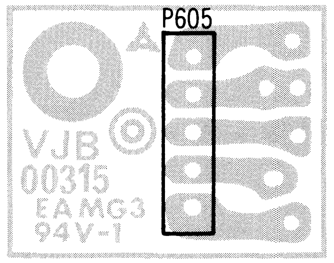
L.E.D. CIRCUIT BOARD (VJB00170)


POWER LAMP
MOIST LAMP
GND
VJB00170
6732V
P608
1
2
3
D6302
GL52AR
D6301
LN41YP

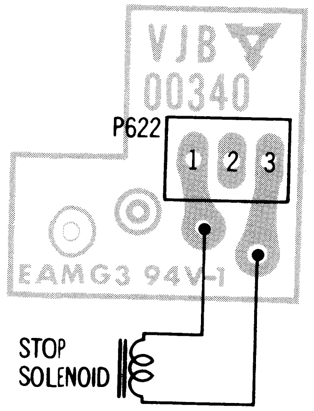
CAPSTAN MOTOR INTERCONNECTION CIRCUIT BOARD (VJB00171)


P605
PG
GND
GND
FG
(+)
CAP. MOTOR
(−)
1
2
3
4
5
CAP. PG.
CAP. FG.
(+)
CAP. MOTOR
(−)

AUDIO/CONTROL HEAD INTERCONNECTION CIRCUIT BOARD (VJB00315)


P605
VJB
00315
EAMG3
94V-1

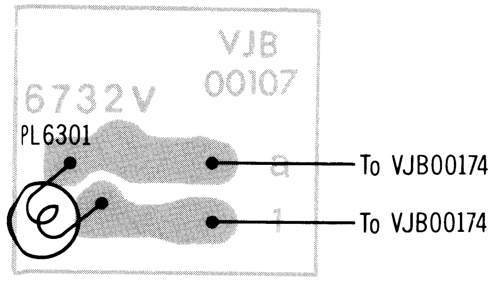
STOP SOLENOID CIRCUIT BOARD (VJB00340)


VJB
00340
P622
1
2
3
EAMG3 94V-1
STOP
SOLENOID

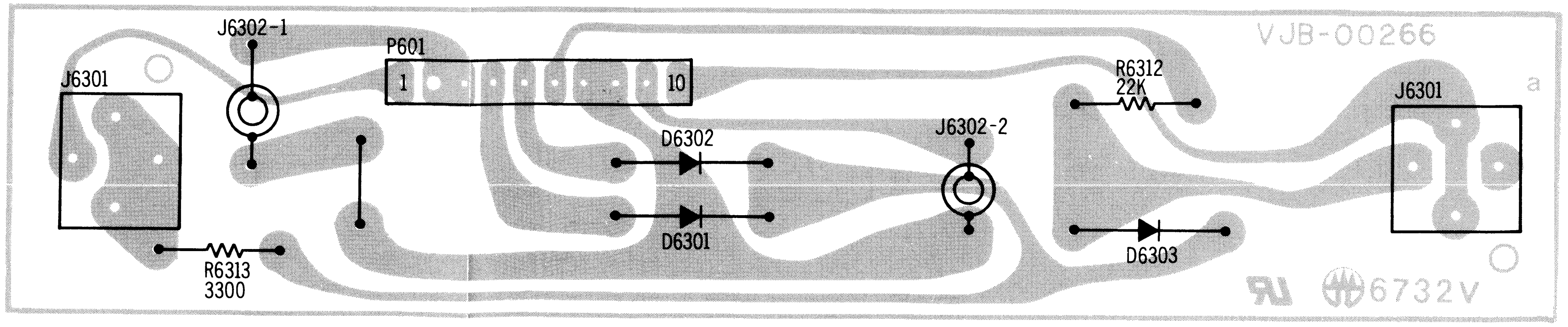
P622

1	STOP SOLENOID (+)
2	
3	STOP SOLENOID (−)

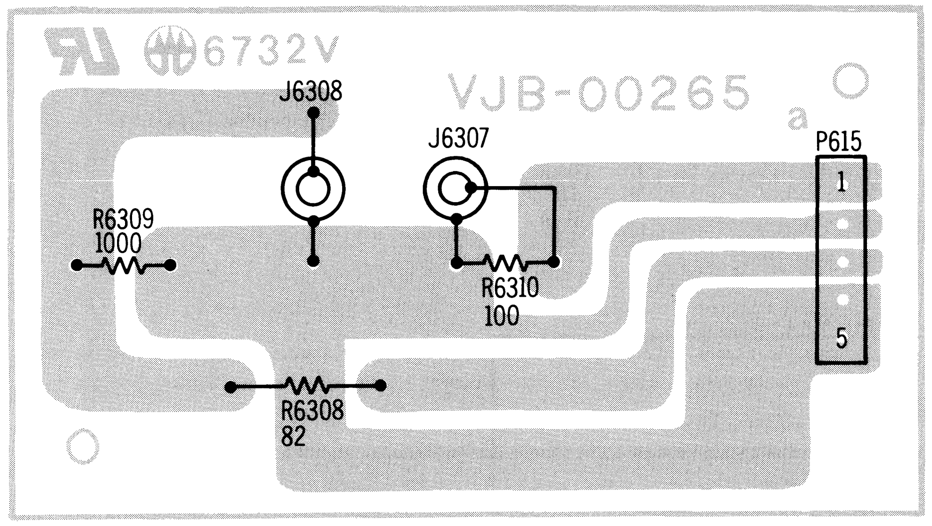
LAMP CIRCUIT BOARD (VJB00107)


VJB
00107
6732V
PL6301
To VJB00174
To VJB00174

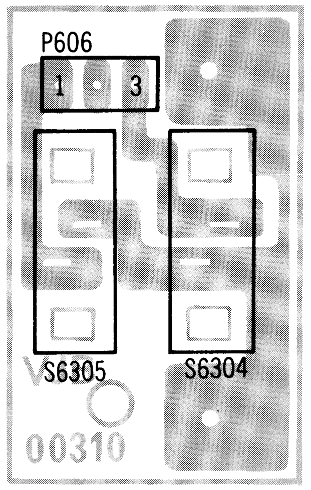
REAR JACK CIRCUIT BOARD (VJB00266)


J6302-1
J6301
P601
1
10
R6313
3300
D6302
D6301
J6302-2
R6312
22K
D6303
J6301
VJB-00266
6732V

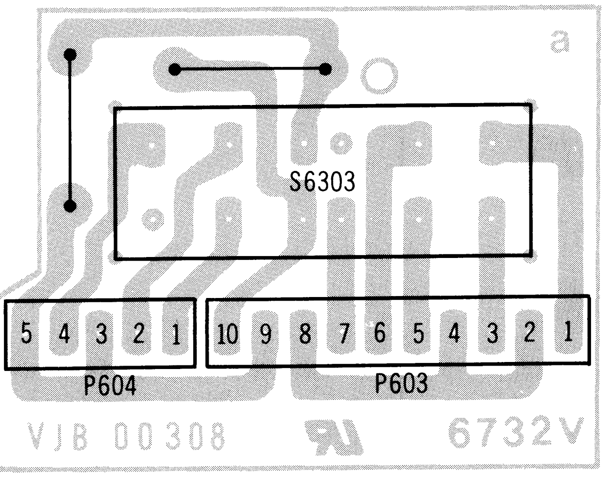
REAR ANGLE CIRCUIT BOARD (VJB00265)


6732V
VJB-00265
a
J6308
J6307
P615
1
5
R6309
1000
R6310
100
R6308
82

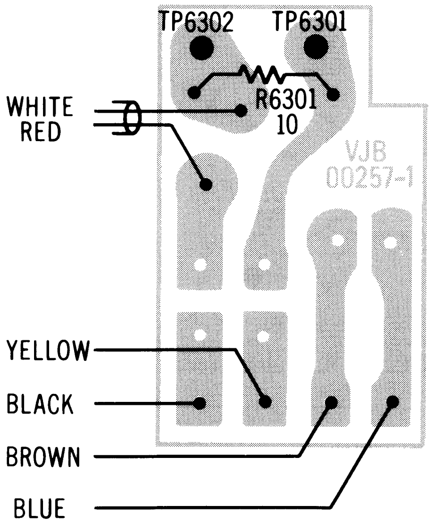
LEAF SWITCH CIRCUIT BOARD (VJB00310)


P606
1
3
S6305
S6304
00310

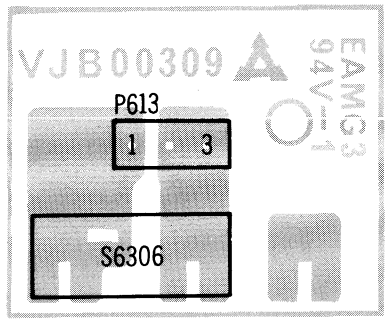
INPUT SELECTOR SWITCH CIRCUIT BOARD (VJB00308)


a
S6303
5 4 3 2 1
10 9 8 7 6 5 4 3 2 1
P604
P603
VJB 00308
6732V

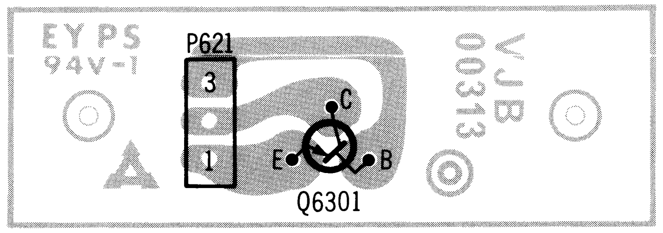
AUDIO/CONTROL HEAD CIRCUIT BOARD (VJB00257)


TP6302
TP6301
WHITE
RED
R6301
10
VJB
00257-1
YELLOW
BLACK
BROWN
BLUE

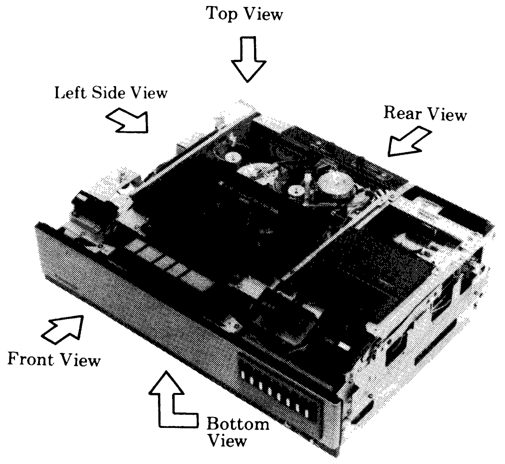
MICRO SWITCH CIRCUIT BOARD (VJB00309)


VJB00309
EAMG3
94V-1
P613
1
3
S6306

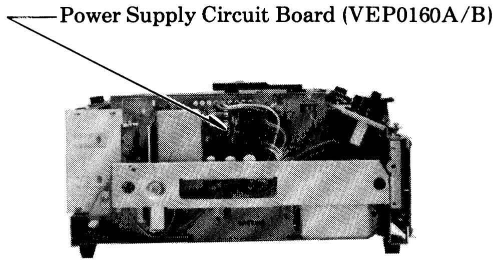
POWER TRANSISTOR CIRCUIT BOARD (VJB00313)


EYPS
94V-1
P621
3
1
C
E
B
Q6301
VJB
00313

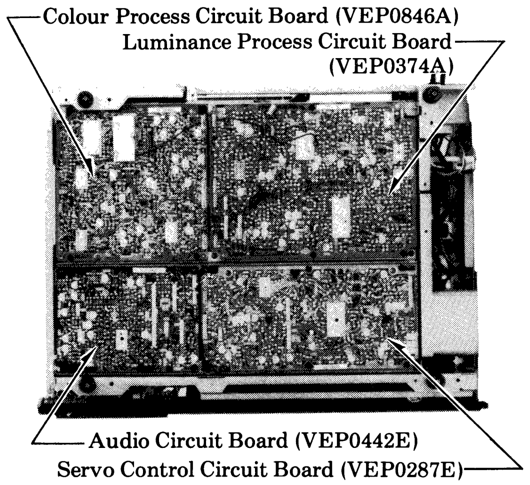
INNER PARTS LOCATION


Top View
Left Side View
Rear View
Front View
Bottom View

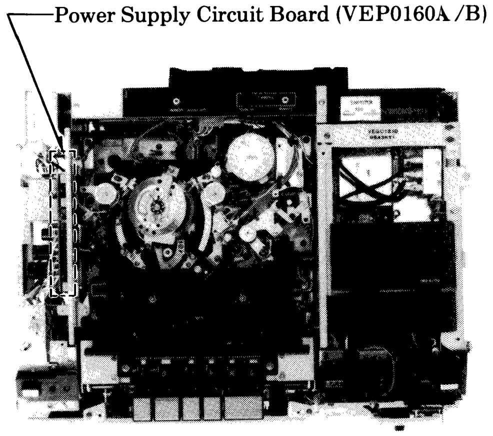
LEFT SIDE VIEW


Power Supply Circuit Board (VEP0160A/B)

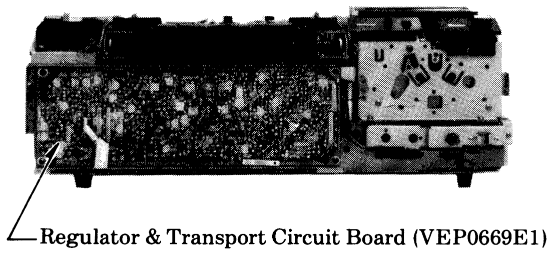
BOTTOM VIEW


Colour Process Circuit Board (VEP0846A)
Luminance Process Circuit Board (VEP0374A)
Audio Circuit Board (VEP0442E)
Servo Control Circuit Board (VEP0287E)

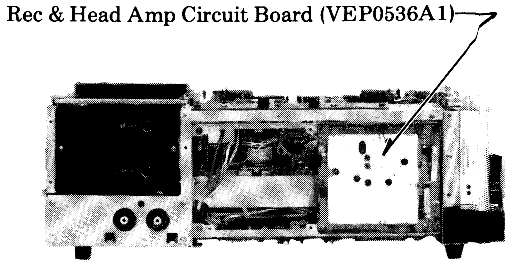
TOP VIEW


Power Supply Circuit Board (VEP0160A/B)

FRONT VIEW


Regulator & Transport Circuit Board (VEP0669E1)

REAR VIEW


Rec & Head Amp Circuit Board (VEP0536A1)

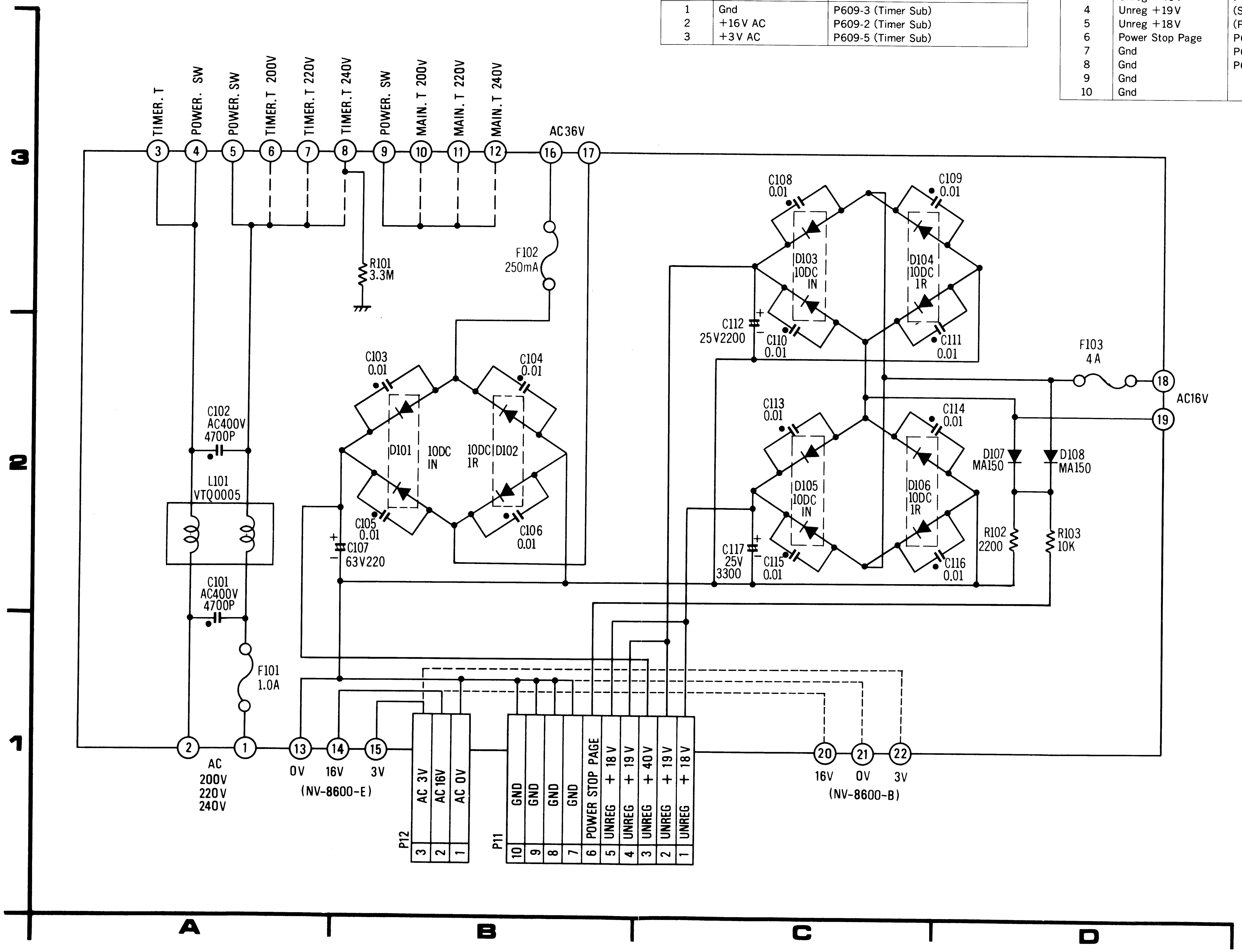
POWER SUPPLY SCHEMATIC DIAGRAM (NV-8600-E) (NV-8600-B)

P12 (Power Supply)

PIN NO.	SIGNAL NAME	DESTINATION
1	Gnd	P609-3 (Timer Sub)
2	+16V AC	P609-2 (Timer Sub)
3	+3V AC	P609-5 (Timer Sub)

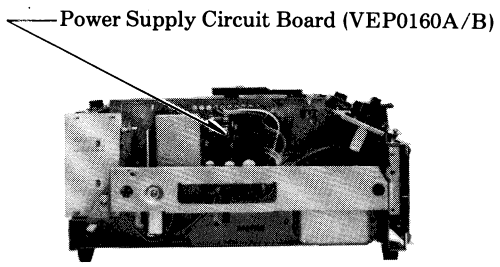
P11 (Power Supply)

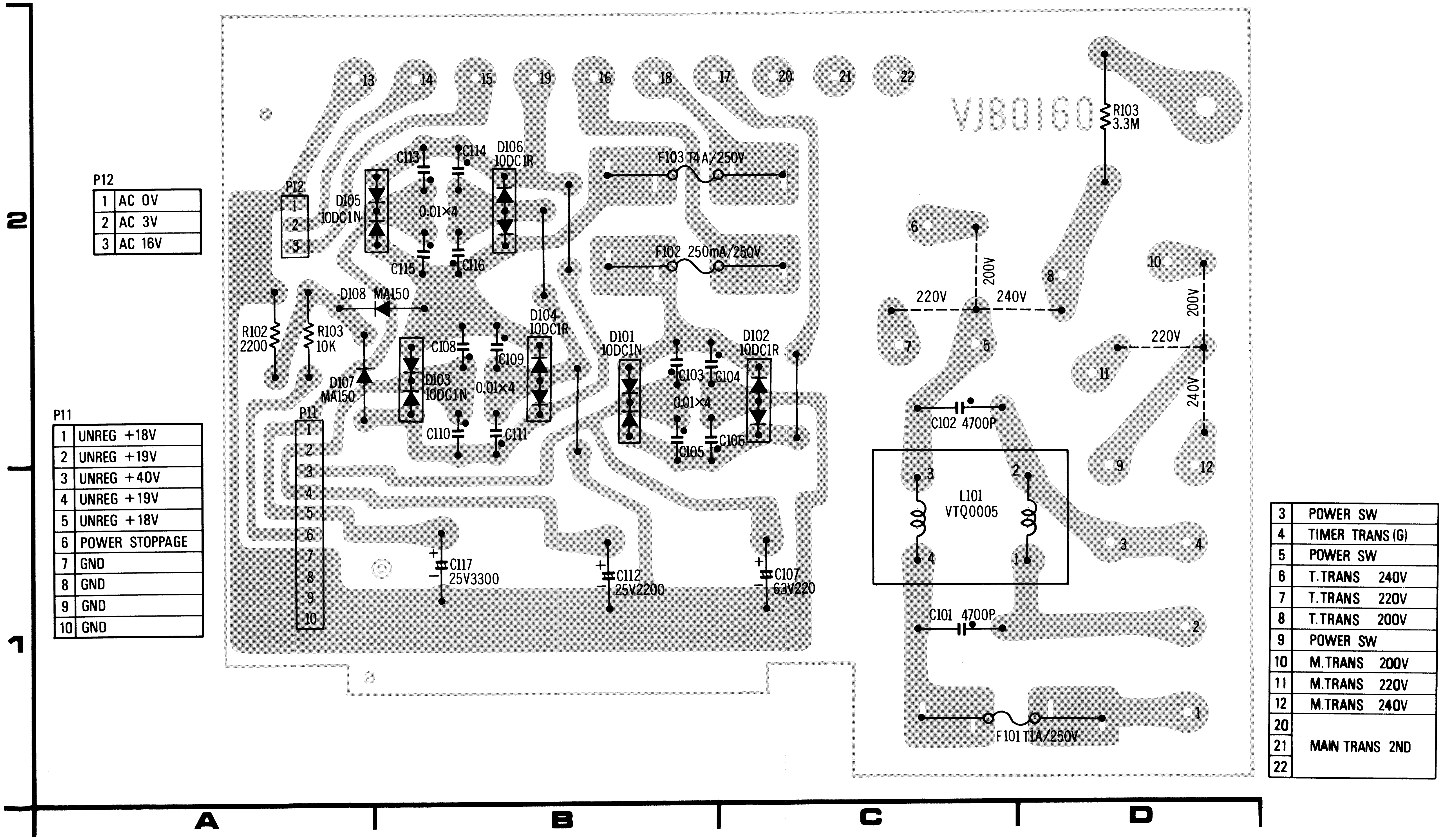
PIN NO.	SIGNAL NAME	DESTINATION
1	Unreg +18V	P62-8 (Transport Circuit)
2	Unreg +19V	P62-3 (Transport Circuit)
3	Unreg +40V	P704-2 (TV Demodulator)
4	Unreg +19V	(Stop Sol)
5	Unreg +18V	(Pressure Roller Sol)
6	Power Stop Page	P62-7 (Transport Circuit)
7	Gnd	P62-5 (Transport Circuit)
8	Gnd	P614-2 (Reel Sensor)
9	Gnd	—
10	Gnd	—



3
2
1
A
B
C
D
TIMER. T
POWER. SW
POWER. SW
TIMER. T 200V
TIMER. T 220V
TIMER. T 240V
POWER. SW
MAIN. T 200V
MAIN. T 220V
MAIN. T 240V
AC36V
3
4
5
6
7
8
9
10
11
12
16
17
R101
3.3M
F102
250mA
C103
0.01
C104
0.01
D101
10DC
IN
10DC
1R
D102
C105
0.01
C106
0.01
C107
63V220
C102
AC400V
4700P
L101
VTQ0005
C101
AC400V
4700P
F101
1.0A
C108
0.01
C109
0.01
D103
10DC
IN
D104
10DC
1R
C112
25V2200
C110
0.01
C111
0.01
F103
4A
18
AC16V
19
C113
0.01
C114
0.01
D105
10DC
IN
D106
10DC
1R
C117
25V
3300
C115
0.01
C116
0.01
D107
MA150
D108
MA150
R102
2200
R103
10K
2
1
AC
200V
220V
240V
13
14
15
0V
16V
3V
(NV-8600-E)
AC 3V
AC 16V
AC 0V
P12
3
2
1
GND
GND
GND
GND
POWER STOP PAGE
UNREG + 18V
UNREG + 19V
UNREG + 40V
UNREG + 19V
UNREG + 18V
P11
10
9
8
7
6
5
4
3
2
1
20
21
22
16V
0V
3V
(NV-8600-B)

POWER SUPPLY CIRCUIT BOARD (VEP0160A, NV-8600-E) (VEP0160B, NV-8600-B)


Power Supply Circuit Board (VEP0160A/B)


VJB0160
13
14
15
19
16
18
17
20
21
22
R103 3.3M
C113
C114
D106 10DC1R
D105 10DC1N
0.01×4
C115
C116
F103 T4A/250V
F102 250mA/250V
D108 MA150
R102 2200
R103 10K
D107 MA150
C108
C109
D103 10DC1N
0.01×4
C110
C111
D104 10DC1R
D101 10DC1N
C103
C104
0.01×4
C105
C106
D102 10DC1R
C117 25V3300
C112 25V2200
C107 63V220
a
6
7
5
8
200V
220V
240V
10
11
12
9
C102 4700P
L101 VTQ0005
3
2
4
1
C101 4700P
F101 T1A/250V
2
1
A
B
C
D

P12

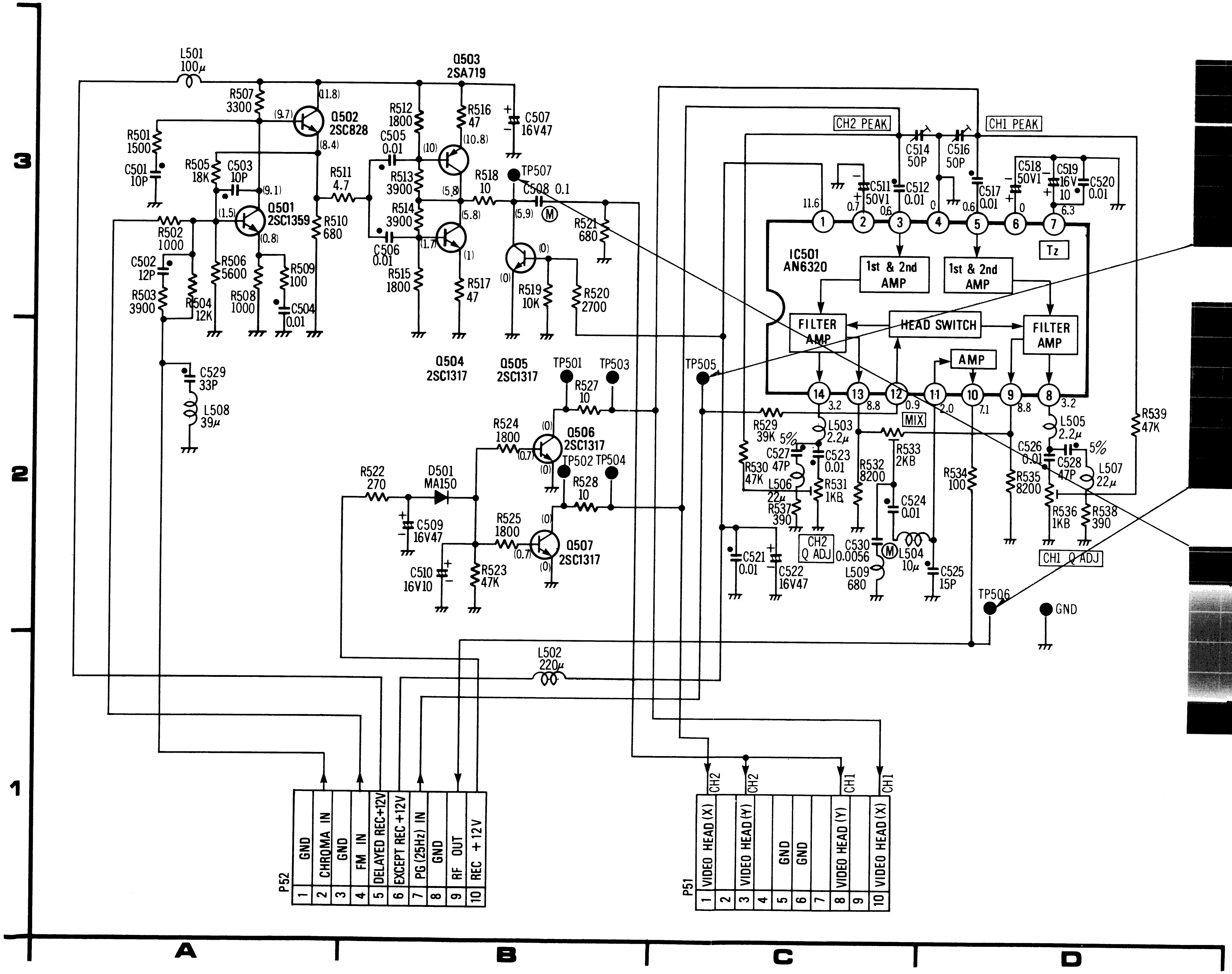
1	AC 0V
2	AC 3V
3	AC 16V

P11

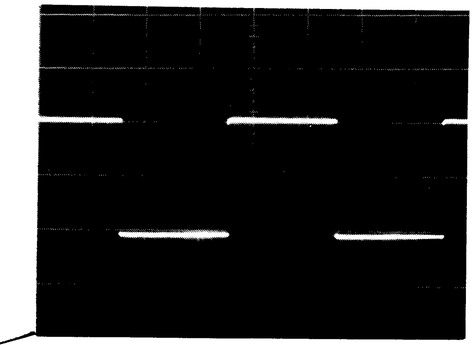
1	UNREG +18V
2	UNREG +19V
3	UNREG +40V
4	UNREG +19V
5	UNREG +18V
6	POWER STOPPAGE
7	GND
8	GND
9	GND
10	GND

3	POWER SW
4	TIMER TRANS (G)
5	POWER SW
6	T.TRANS 240V
7	T.TRANS 220V
8	T.TRANS 200V
9	POWER SW
10	M.TRANS 200V
11	M.TRANS 220V
12	M.TRANS 240V
20 21 22	MAIN TRANS 2ND

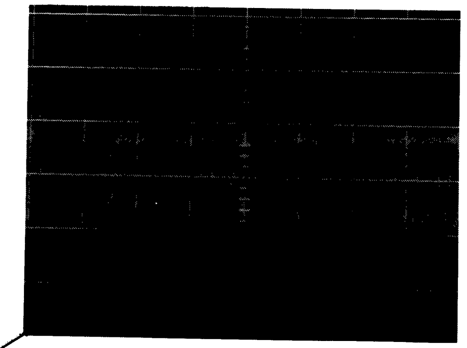
REC & HEAD AMP SCHEMATIC DIAGRAM


3
2
1
A
B
C
D
L501
100μ
Q503
2SA719
R507
3300
(11.8)
(9.7)
Q502
2SC828
(8.4)
R512
1800
C505
0.01
(10)
R516
47
(10.8)
C507
16V47
R501
1500
C501
10P
R505
18K
C503
10P
(9.1)
(1.5)
Q501
2SC1359
(0.8)
R511
4.7
R510
680
R513
3900
(5.8)
R514
3900
(1.7)
(5.8)
R518
10
TP507
C508 0.1
(5.9)
M
R521
680
R502
1000
C502
12P
R503
3900
R504
12K
R506
5600
R508
1000
R509
100
C504
0.01
C506
0.01
R515
1800
(1)
R517
47
(0)
(0)
R519
10K
R520
2700
C529
33P
L508
39μ
Q504
2SC1317
Q505
2SC1317
TP501
TP503
R527
10
R524
1800
(0)
(0.7)
Q506
2SC1317
(0)
TP502
TP504
R528
10
R522
270
D501
MA150
C509
16V47
R525
1800
(0)
(0.7)
Q507
2SC1317
(0)
C510
16V10
R523
47K
L502
220μ
TP505
CH2 PEAK
CH1 PEAK
C514
50P
C516
50P
C511
50V1
C512
0.01
C517
0.01
C518
50V1
C519
16V 10
C520
0.01
11.6
0.7
0.6
0
0.6
0
6.3
1
2
3
4
5
6
7
IC501
AN6320
1st & 2nd AMP
1st & 2nd AMP
Tz
FILTER AMP
HEAD SWITCH
FILTER AMP
AMP
14
13
12
11
10
9
8
3.2
8.8
0.9
2.0
7.1
8.8
3.2
MIX
R529
39K 5%
L503
2.2μ
C527
47P
C523
0.01
R533
2KB
R530
47K
L506
22μ
R537
390
R531
1KB
R532
8200
C524
0.01
CH2 Q ADJ
C530
0.0056
M
L504
10μ
L509
680
C525
15P
C521
0.01
C522
16V47
R534
100
R535
8200
C526
0.01
C528
47P
5%
L505
2.2μ
L507
22μ
R536
1KB
R538
390
R539
47K
CH1 Q ADJ
TP506
GND
P52
1 GND
2 CHROMA IN
3 GND
4 FM IN
5 DELAYED REC+12V
6 EXCEPT REC +12V
7 PG (25Hz) IN
8 GND
9 RF OUT
10 REC +12V
P51
1 VIDEO HEAD (X)
2
3 VIDEO HEAD (Y)
4
5 GND
6 GND
7
8 VIDEO HEAD (Y)
9
10 VIDEO HEAD (X)
CH2
CH2
CH1
CH1

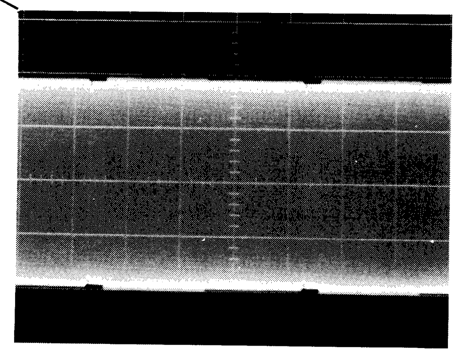
TP505
5V/10msec. div.



TP506 P.B. Mode
0.2V/5msec. div.



TP507 Rec Mode
1V/5msec. div.



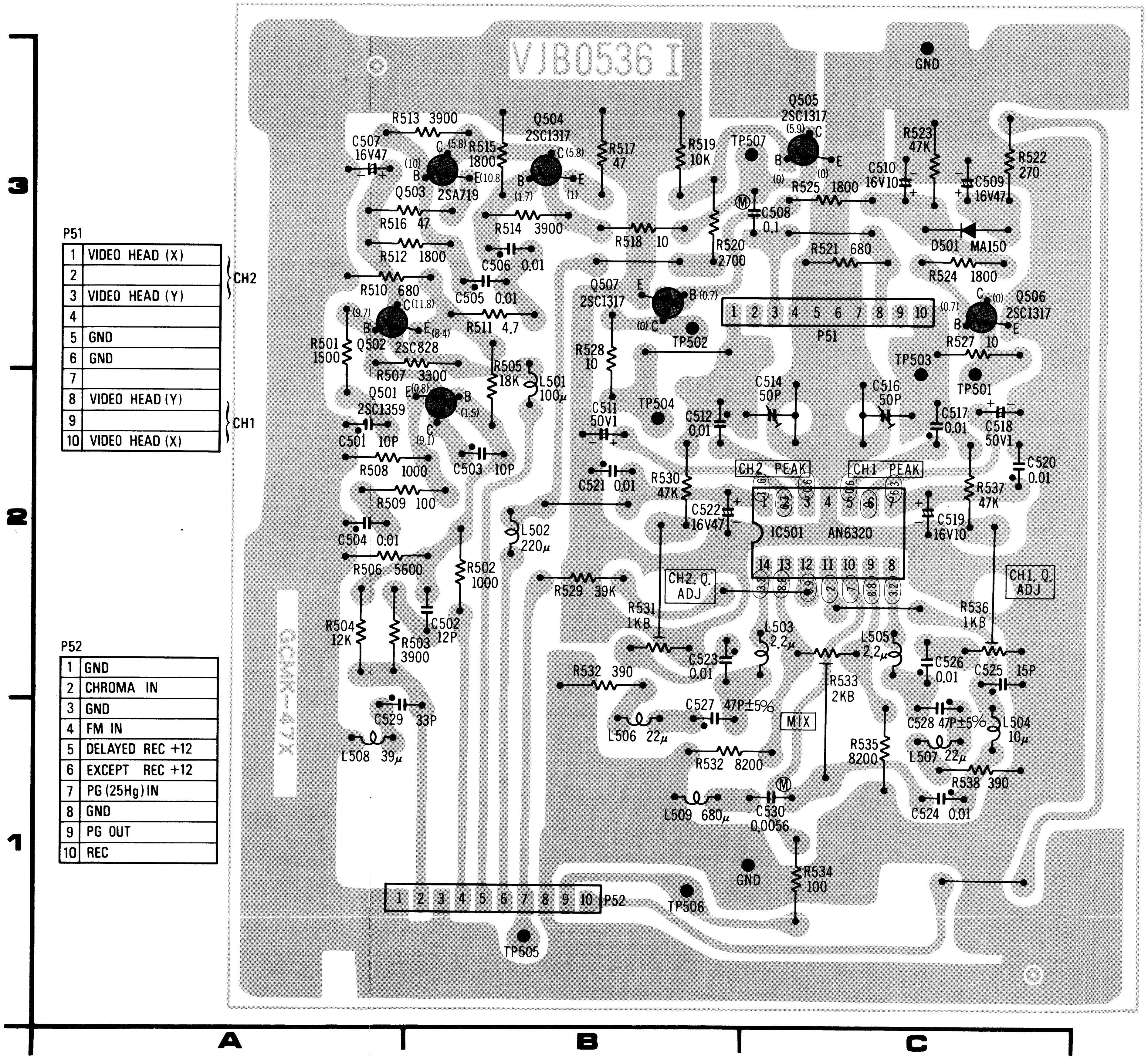
REC & HEAD AMP CIRCUIT BOARD (VEP0536A1)

P52 (Rec & Head Amp)

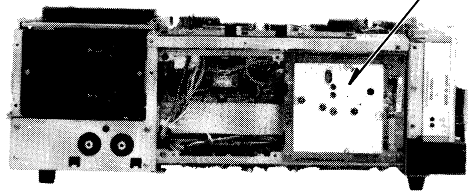
PIN NO.	SIGNAL NAME	DESTINATION
1	Gnd	P34-4 (Luminance Process)
2	Chroma In	P34-5 (Luminance Process)
3	Gnd	P35-1 (Luminance Process)
4	Fm In	P35-2 (Luminance Process)
5	Delayed Rec +12 V	P34-2 (Luminance Process)
6	Except Rec +12 V	P35-3 (Luminance Process)
7	PG (25 Hz) In	P34-3 (Luminance Process)
8	Gnd	P35-5 (Luminance Process)
9	Rf Out	P35-4 (Luminance Process)
10	Rec +12 V	P34-1 (Luminance Process)

P51 (Rec & Head Amp)

PIN NO.	SIGNAL NAME	DESTINATION
1	Video Head (X)	—
2	—	—
3	Video Head (Y)	—
4	—	—
5	Gnd	—
6	Gnd	—
7	—	—
8	Video Head (Y)	—
9	—	—
10	Video Head (X)	—

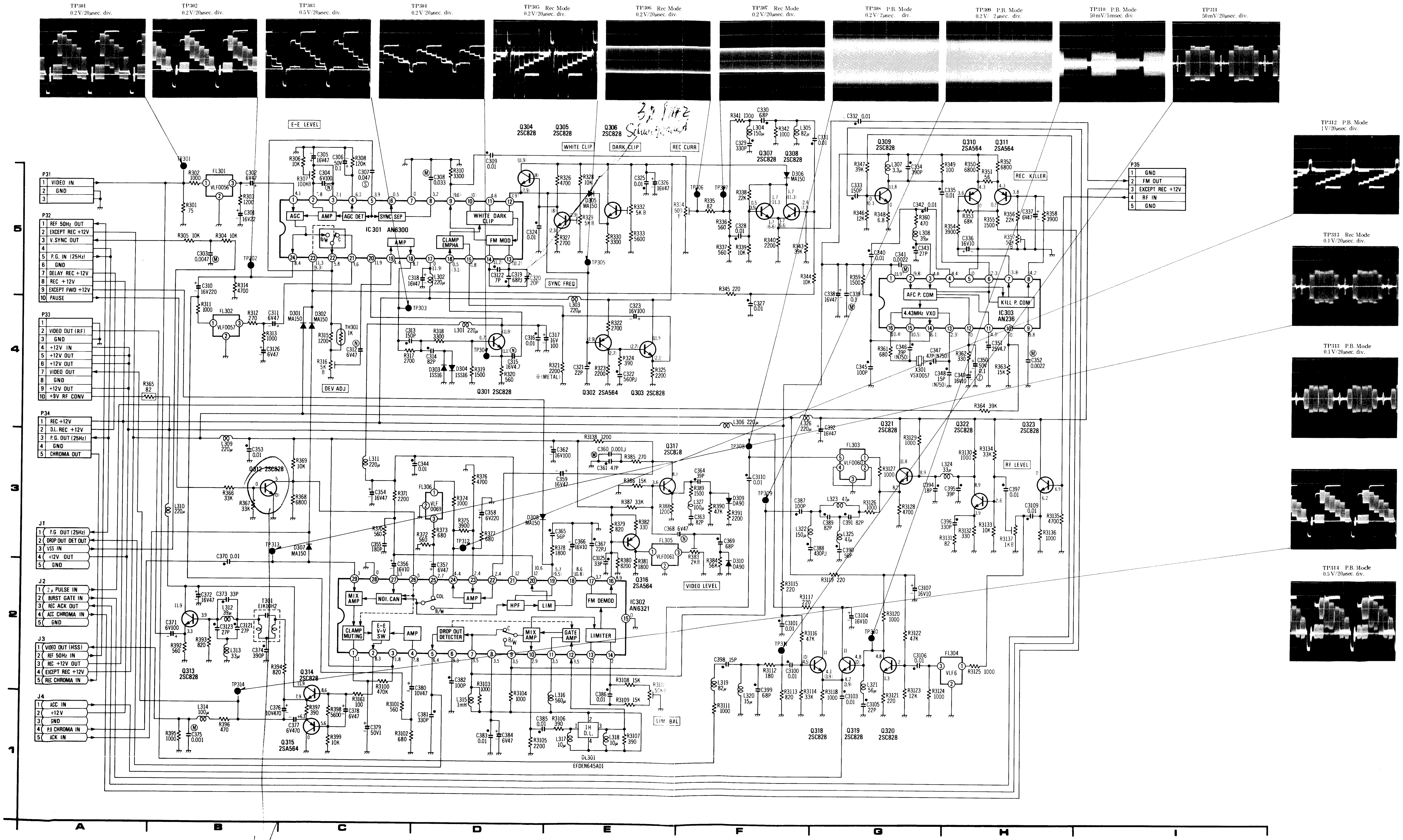

3
2
1
A
B
C
P51
1 VIDEO HEAD (X)
2
3 VIDEO HEAD (Y)
4
5 GND
6 GND
7
8 VIDEO HEAD (Y)
9
10 VIDEO HEAD (X)
CH2
CH1
P52
1 GND
2 CHROMA IN
3 GND
4 FM IN
5 DELAYED REC +12
6 EXCEPT REC +12
7 PG (25Hg) IN
8 GND
9 PG OUT
10 REC
VJB0536 I
GCMK-47X
GND
R513 3900
C507 16V47
Q503 2SA719
R515 1800
Q504 2SC1317
R517 47
R519 10K
TP507
Q505 2SC1317
R523 47K
R522 270
C510 16V10
C509 16V47
R525 1800
C508 0.1
R516 47
R514 3900
R518 10
R520 2700
R521 680
D501 MA150
R512 1800
C506 0.01
R524 1800
R510 680
C505 0.01
Q507 2SC1317
Q506 2SC1317
R511 4.7
TP502
P51
R527 10
R501 1500
Q502 2SC828
R528 10
TP503
R507 3300
R505 18K
L501 100μ
C514 50P
C516 50P
TP501
Q501 2SC1359
C511 50V1
TP504
C512 0.01
C517 0.01
C518 50V1
C501 10P
C503 10P
R508 1000
C521 0.01
R530 47K
CH2 PEAK
CH1 PEAK
C520 0.01
R509 100
R537 47K
C522 16V47
C519 16V10
IC501 AN6320
C504 0.01
L502 220μ
R506 5600
R502 1000
R529 39K
CH2. Q. ADJ
CH1. Q. ADJ
R531 1KB
R536 1KB
R504 12K
R503 3900
C502 12P
L503 2.2μ
L505 2.2μ
R532 390
C523 0.01
R533 2KB
C526 0.01
C525 15P
C529 33P
C527 47P±5%
MIX
C528 47P±5%
L504 10μ
L506 22μ
R535 8200
L508 39μ
R532 8200
L507 22μ
R538 390
L509 680μ
C530 0.0056
C524 0.01
GND
R534 100
P52
TP506
TP505

Rec & Head Amp Circuit Board (VEP0536A1)



Rec. & Head Amp. Circuit Board	
Q501	B-2
Q502	A-3
Q503	B-3
Q504	B-3
Q505	C-3
Q506	C-3
Q507	B-3

LUMINANCE PROCESS SCHEMATIC DIAGRAM


TP301 0.2V/20μsec. div.
TP302 0.2V/20μsec. div.
TP303 0.5V/20μsec. div.
TP304 0.2V/20μsec. div.
TP305 Rec Mode 0.2V/20μsec. div.
TP306 Rec Mode 0.2V/20μsec. div.
TP307 Rec Mode 0.2V/20μsec. div.
TP308 P.B. Mode 0.2V/2μsec. div.
TP309 P.B. Mode 0.2V/2μsec. div.
TP310 P.B. Mode 50mV/5msec. div.
TP311 50mV/20μsec. div.
TP312 P.B. Mode 1V/20μsec. div.
TP313 Rec Mode 0.1V/20μsec. div.
TP313 P.B. Mode 0.1V/20μsec. div.
TP314 P.B. Mode 0.5V/20μsec. div.
3,8 MHz
Schwingend
E-E LEVEL
WHITE CLIP
DARK CLIP
REC CURR
REC KILLER
SYNC FREQ
DEV ADJ
RF LEVEL
VIDEO LEVEL
LIM BAL
IC301 AN6300
AGC
AMP
AGC DET
SYNC SEP
WHITE DARK CLIP
CLAMP EMPHA
FM MOD
IC302 AN6321
MIX AMP
NOI. CAN
HPF
LIM
FM DEMOD
CLAMP MUTING
E-E V-V SW
DROP OUT DETECTER
GATE AMP
LIMITER
IC303 AN236
AFC P. COM
4.43MHz VXO
KILL P. COM
DL301 EFDEN645A01
FL301 VLF0056
FL302 VLF0057
FL303 VLF0060
FL304 VLF6
FL305 VLF0061
FL306 VLF0069
T301 EIK10H2
X301 VSX0057
Q301 2SC828
Q302 2SA564
Q303 2SC828
Q304 2SC828
Q305 2SC828
Q306 2SC828
Q307 2SC828
Q308 2SC828
Q309 2SC828
Q310 2SA564
Q311 2SA564
Q312 2SC828
Q313 2SC828
Q314 2SC828
Q315 2SA564
Q316 2SA564
Q317 2SC828
Q318 2SC828
Q319 2SC828
Q320 2SC828
Q321 2SC828
Q322 2SC828
Q323 2SC828
P31
1 VIDEO IN
2 GND
3
P32
1 REF 50Hz OUT
2 EXCEPT REC +12V
3 V.SYNC OUT
4
5 P.G. IN (25Hz)
6 GND
7 DELAY REC +12V
8 REC +12V
9 EXCEPT FWD +12V
10 PAUSE
P33
1
2 VIDEO OUT (RF)
3 GND
4 +12V IN
5 +12V OUT
6 +12V OUT
7 VIDEO OUT
8 GND
9 +12V OUT
10 +9V RF CONV
P34
1 REC +12V
2 D.L. REC +12V
3 P.G. OUT (25Hz)
4 GND
5 CHROMA OUT
P35
1 GND
2 FM OUT
3 EXCEPT REC +12V
4 RF IN
5 GND
J1
1 P.G OUT (25Hz)
2 DROP OUT DET OUT
3 VSS IN
4 +12V OUT
5 GND
J2
1 2μ PULSE IN
2 BURST GATE IN
3 REC ACK OUT
4 ACC CHROMA IN
5 GND
J3
1 VIDEO OUT (HSS)
2 REF 50Hz IN
3 REC +12V OUT
4 EXCEPT REC +12V
5 REC CHROMA IN
J4
1 ACC IN
2 +12V
3 GND
4 P.B CHROMA IN
5 ACK IN
5
4
3
2
1
A
B
C
D
E
F
G
H
I

Emitter - Basis kurzschließen

Standbild

P31 (Luminance Process)

PIN NO.	SIGNAL NAME	DESTINATION
1	Video In	P603-5 (Input Selector)
2	Gnd	P603-4 (Input Selector)
2	—	—

P32 (Luminance Process)

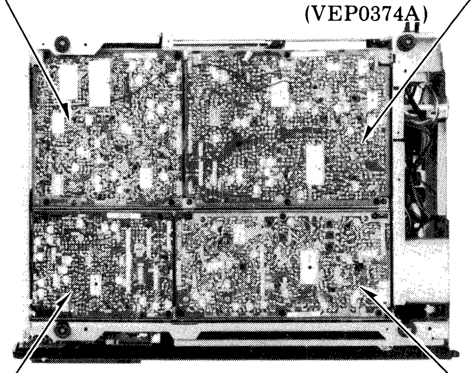
PIN NO.	SIGNAL NAME	DESTINATION
1	Ref 50Hz Out	P22-5 (Control Section)
2	Except Rec +12V	P43-9 (Audio Section)
3	V-Sync Out	P22-3 (Control Section)
4	—	—
5	P.G. In (25Hz)	P22-2 (Control Section)
6	Gnd	P21-6 (Control Section)
7	Delay Rec +12V	P21-1 (Control Section)
8	Rec +12V	P22-6 (Control Section)
9	E-E, V-V Select	P21-4 (Control Section)
10	Pause	P44-3 (Audio Section)

P33 (Luminance Process)

PIN NO.	SIGNAL NAME	DESTINATION
1	—	—
2	Video Out	Video for Rf (Rf Converter)
3	Gnd	Gnd (Rf Converter)
4	+12V In	P62-10 (Transport Section)
5	+12V Out	P601-6 (Rear Jack Connection)
6	+12V Out	P603-6 (Input Selector)
7	Video Out	P615-3 (Rear Angle)
8	Gnd	P615-4 (Rear Angle)
9	+12V Out	P704-1 (TV Demodulator Section)
10	+9V Rf Conv	+9V (Rf Converter Section)

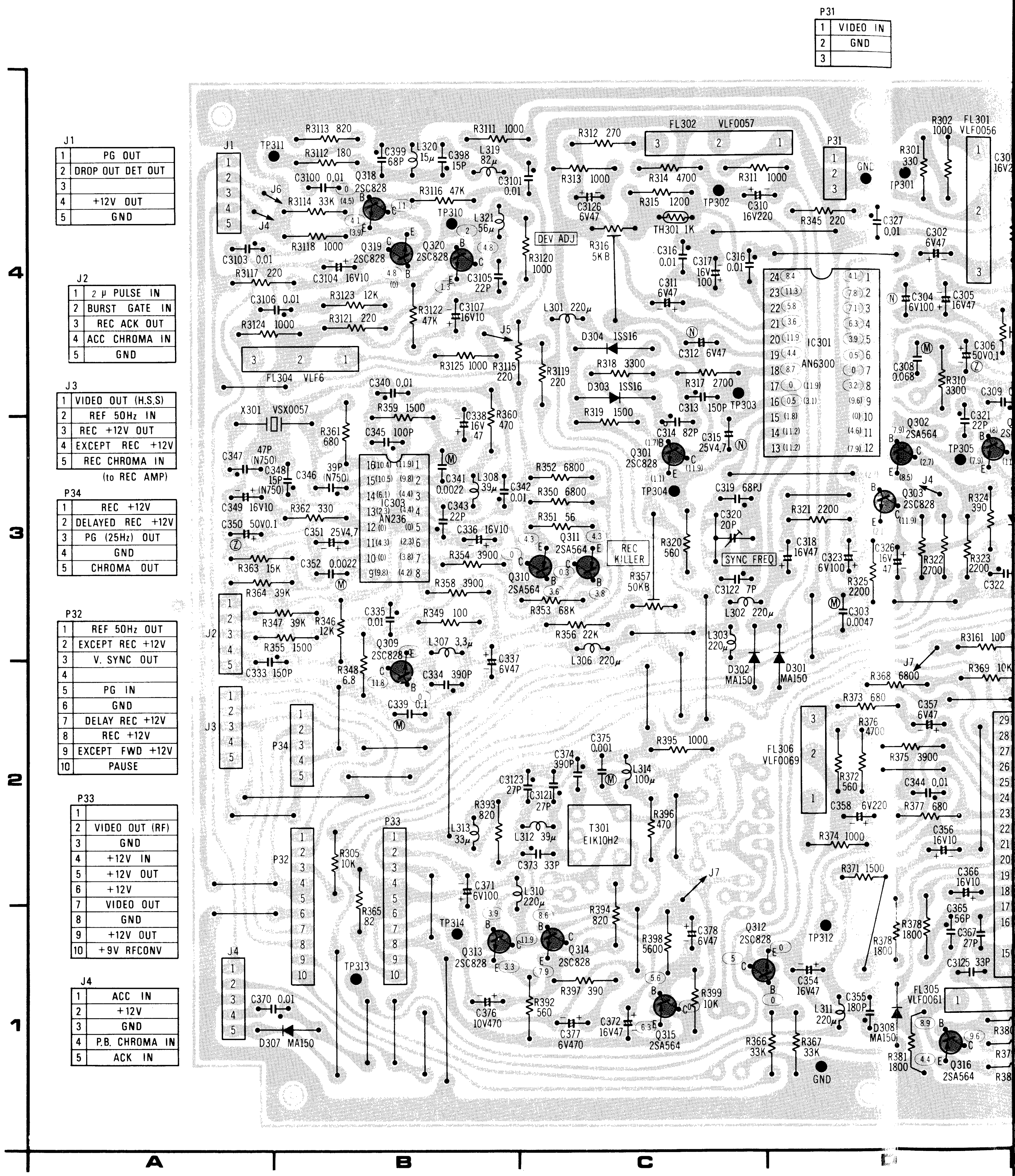
P34 (Luminance Process)

PIN NO.	SIGNAL NAME	DESTINATION
1	Rec +12V	P52-10 (Rec & Head Amp)
2	D.L. Rec +12V	P52-5 (Rec & Head Amp)
3	P.G. Out (25Hz)	P52-7 (Rec & Head Amp)
4	Gnd	P52-1 (Rec & Head Amp)
5	Chroma Out	P52-2 (Rec & Head Amp)


Colour Process Circuit Board (VEP0846A)
Luminance Process Circuit Board (VEP0374A)
Audio Circuit Board (VEP0442E)
Servo Control Circuit Board (VEP0287E)

Luminance Process Circuit Board	
Q301	C-3
Q302	D-3
Q303	D-3
Q304	D-3
Q305	E-3
Q306	E-3
Q307	E-4
Q308	E-4
Q309	B-2
Q310	C-3
Q311	C-3
Q312	C-1
Q313	B-1
Q314	C-1
Q315	C-1
Q316	D-1
Q317	F-1
Q318	B-4
Q319	B-4
Q320	B-4
Q321	F-3
Q322	F-3
Q323	F-3
Q324	F-4
Q325	F-4
Q326	F-4
Q327	F-3
Q328	F-3
IC301	D-3
IC302	E-2
IC303	B-3
IC304	F-4

LUMINANCE PROCESS CIRCUIT BOARD (VEP0374A)


P31
1 VIDEO IN
2 GND
3
J1
1 PG OUT
2 DROP OUT DET OUT
3
4 +12V OUT
5 GND
J2
1 2 μ PULSE IN
2 BURST GATE IN
3 REC ACK OUT
4 ACC CHROMA IN
5 GND
J3
1 VIDEO OUT (H.S.S)
2 REF 50Hz IN
3 REC +12V OUT
4 EXCEPT REC +12V
5 REC CHROMA IN
(to REC AMP)
P34
1 REC +12V
2 DELAYED REC +12V
3 PG (25Hz) OUT
4 GND
5 CHROMA OUT
P32
1 REF 50Hz OUT
2 EXCEPT REC +12V
3 V. SYNC OUT
4
5 PG IN
6 GND
7 DELAY REC +12V
8 REC +12V
9 EXCEPT FWD +12V
10 PAUSE
P33
1
2 VIDEO OUT (RF)
3 GND
4 +12V IN
5 +12V OUT
6 +12V
7 VIDEO OUT
8 GND
9 +12V OUT
10 +9V RFCONV
J4
1 ACC IN
2 +12V
3 GND
4 P.B. CHROMA IN
5 ACK IN
IC301 AN6300
IC303 AN236
FL302 VLF0057
FL304 VLF6
FL306 VLF0069
FL305 VLF0061
X301 VSX0057
T301 EIK10H2
DEV ADJ
REC KILLER
SYNC FREQ
4
3
2
1
A
B
C

LUMINANCE PROCESS CIRCUIT BOARD (VEP0374A)

P31

1	VIDEO IN
2	GND
3	

J1

1	PG OUT
2	DROP OUT DET OUT
3	
4	+12V OUT
5	GND

J2

1	2 µ PULSE IN
2	BURST GATE IN
3	REC ACK OUT
4	ACC CHROMA IN
5	GND

J3

1	VIDEO OUT (H.S.S)
2	REF 50Hz IN
3	REC +12V OUT
4	EXCEPT REC +12V
5	REC CHROMA IN

(to REC AMP)

P34

1	REC +12V
2	DELAYED REC +12V
3	PG (25Hz) OUT
4	GND
5	CHROMA OUT

P32

1	REF 50Hz OUT
2	EXCEPT REC +12V
3	V. SYNC OUT
4	
5	PG IN
6	GND
7	DELAY REC +12V
8	REC +12V
9	EXCEPT FWD +12V
10	PAUSE

P33

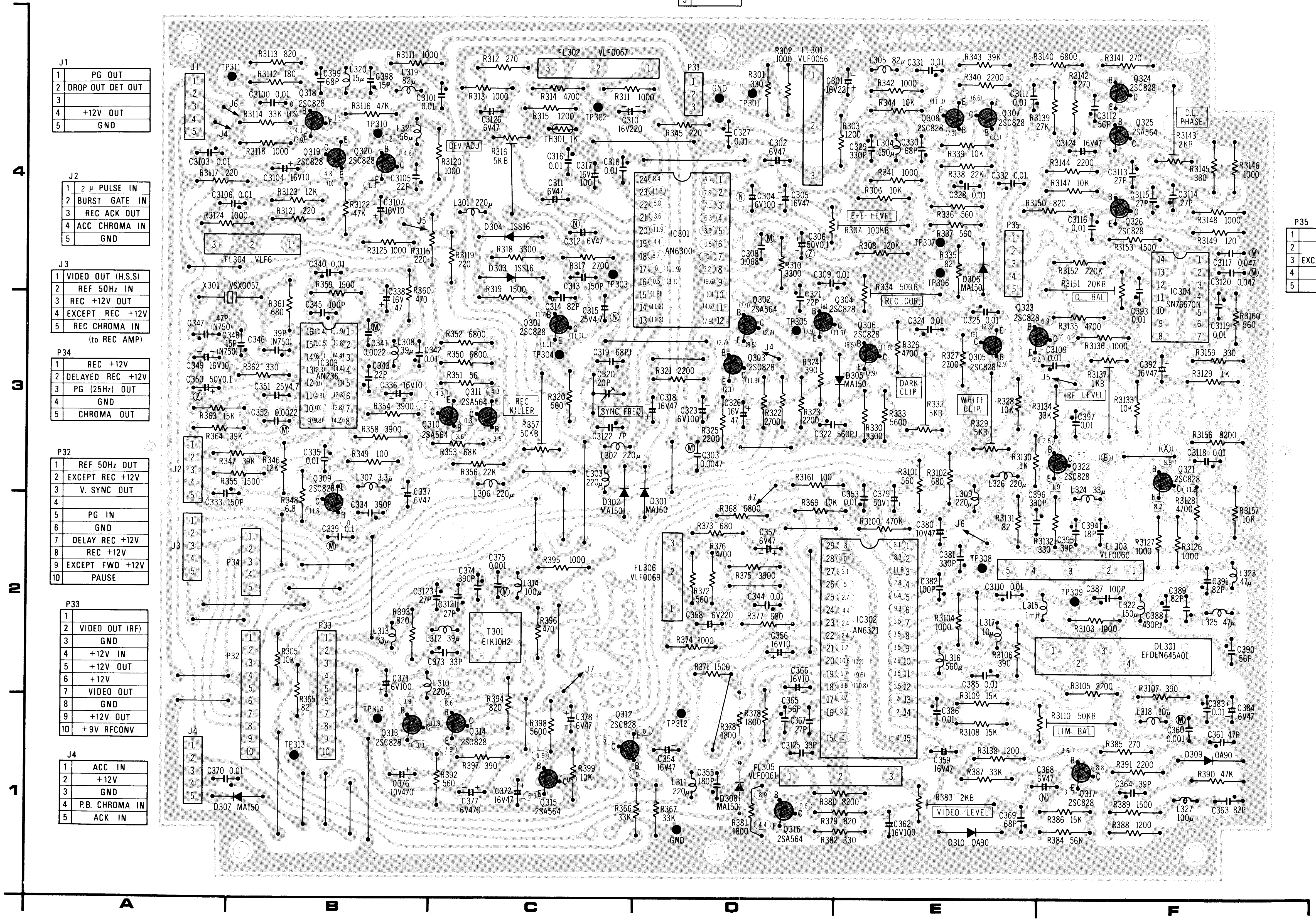
1	
2	VIDEO OUT (RF)
3	GND
4	+12V IN
5	+12V OUT
6	+12V
7	VIDEO OUT
8	GND
9	+12V OUT
10	+9V RFCONV

J4

1	ACC IN
2	+12V
3	GND
4	P.B. CHROMA IN
5	ACK IN

P35

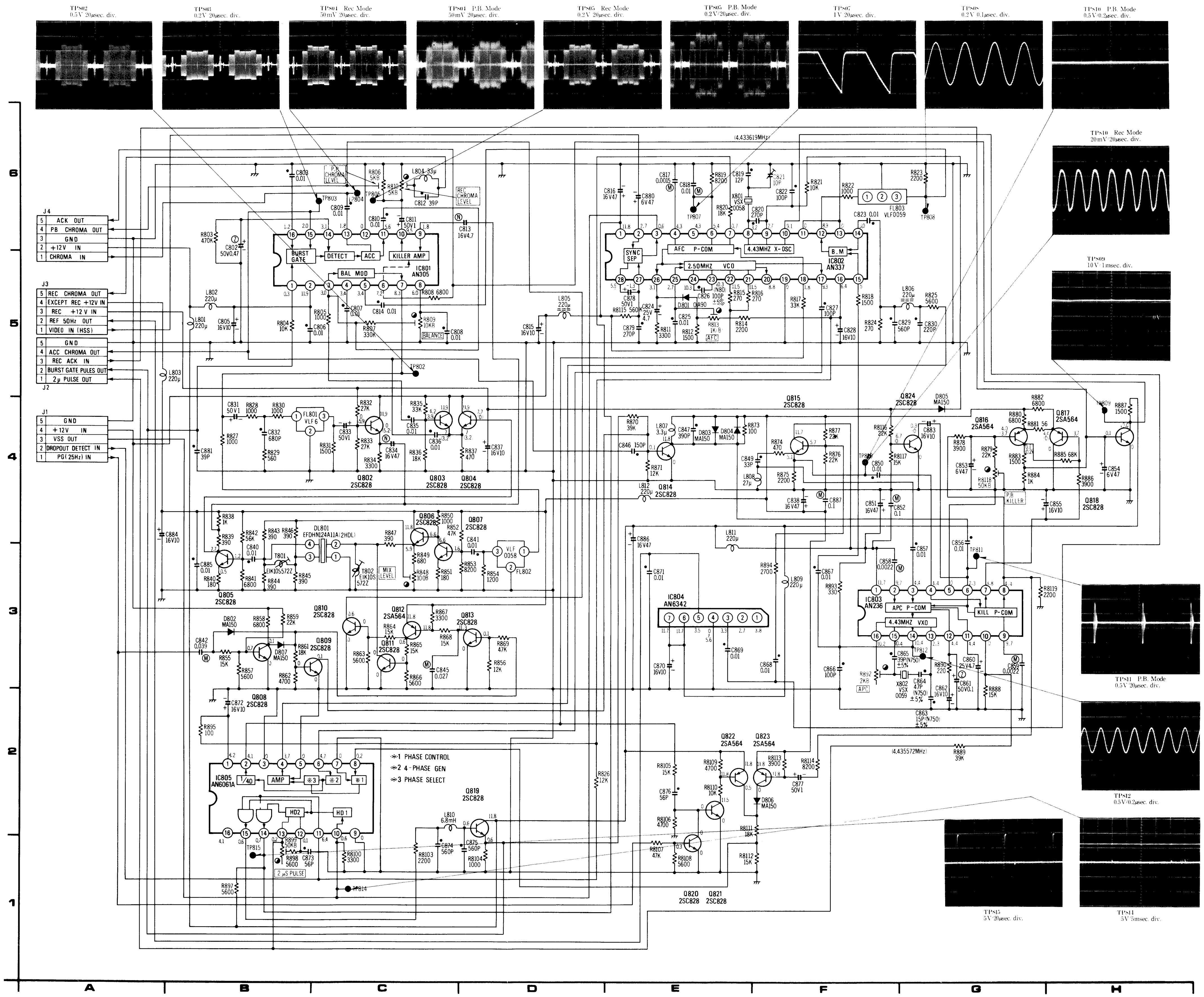
1	GND
2	FM OUT
3	EXCEPT REC +12V
4	RF IN
5	GND



4
3
2
1
A
B
C
D
E
F
EAMG3 94V-1
J1
TP311
R3113 820
R3112 180
C399 68P
L320 15µ
C398 15P
R3111 1000
L319 82µ
C3100 0.01
Q318 2SC828
J6
R3114 33K
J4
R3116 47K
TP310
L321 56µ
C3101 0.01
R3118 1000
Q319 2SC828
Q320 2SC828
C3105 22P
DEV ADJ
R3120 1000
C3103 0.01
R3117 220
C3104 16V10
R3123 12K
R3121 220
R3122 47K
C3107 16V10
C3106 0.01
R3124 1000
FL304 VLF6
J5
R3125 1000
R3115 220
R3119 220
R312 270
FL302 VLF0057
R313 1000
R314 4700
R311 1000
C3126 6V47
R315 1200
TP302
C310 16V220
TH301 1K
R316 5KB
C316 0.01
C317 16V 100
C311 6V47
L301 220µ
D304 1SS16
C312 6V47
R318 3300
D303 1SS16
R317 2700
R319 1500
C313 150P
TP303
C314 82P
C315 25V4.7
Q301 2SC828
TP304
P31
GND
IC301 AN6300
TP301
R302 1000
FL301 VLF0056
R301 330
C301 16V22
R345 220
C327 0.01
R303 1200
C302 6V47
C304 6V100
C305 16V47
C306 50V0.1
R307 100KB
E-E LEVEL
C308 0.068
R310 3300
C309 0.01
C321 22P
R334 500B
REC CUR.
Q302 2SA564
Q304 2SC828
TP305
L305 82µ
C331 0.01
R342 1000
R344 10K
C329 330P
L304 150µ
C330 68P
R341 1000
R306 10K
R308 120K
R343 39K
R340 2200
Q308 2SC828
Q307 2SC828
C3111 0.01
R339 10K
R338 22K
C332 0.01
C328 0.01
R336 560
R337 560
TP307
R335 82
D306 MA150
TP306
P35
R3140 6800
R3141 270
R3142 270
Q324 2SC828
R3139 27K
C3112 56P
Q325 2SA564
D.L. PHASE
R3143 2KB
C3124 16V47
R3144 2200
C3113 27P
R3145 330
R3146 1000
R3147 10K
C3115 27P
C3114 27P
R3150 820
C3116 0.01
Q326 2SC828
R3148 1000
R3153 1500
R3149 120
R3152 220K
R3151 20KB
D.L. BAL
IC304 SN76670N
C3117 0.047
C3120 0.047
C393 0.01
C3119 0.01
R3160 560
X301 VSX0057
C347 47P (N750)
C348 15P (N750)
C346 39P (N750)
C340 0.01
R359 1500
C345 100P
R361 680
C338 16V 47
R360 470
IC303 AN236
C341 0.0022
L308 39µ
C342 0.01
C343 22P
C349 16V10
C350 50V0.1
R362 330
C351 25V4.7
C336 16V10
R363 15K
C352 0.0022
R352 6800
R350 6800
R351 56
Q311 2SA564
REC KILLER
R354 3900
Q310 2SA564
R358 3900
R357 50KB
R353 68K
R364 39K
R347 39K
R346 12K
R355 1500
C333 150P
C335 0.01
R349 100
L307 3.3µ
C337 6V47
Q309 2SC828
R348 6.8
C334 390P
C339 0.1
R356 22K
L306 220µ
C319 68PJ
C320 20P
SYNC FREQ
R320 560
C318 16V47
R321 2200
C322 560PJ
R325 2200
C323 6V100
C326 16V 47
R322 2700
R323 2200
Q303 2SC828
R324 390
D305 MA150
R330 3300
R333 5600
Q306 2SC828
R326 4700
DARK CLIP
C324 0.01
C325 0.01
R327 2700
Q305 2SC828
WHITE CLIP
R332 5KB
R329 5KB
R328 10K
Q323 2SC828
R3135 4700
R3136 1000
C3109 0.01
R3137 1KB
RF LEVEL
R3134 33K
C397 0.01
R3133 10K
C392 16V47
R3159 330
R3129 1K
R3156 8200
C3118 0.01
Q321 2SC828
R3128 4700
R3157 10K
C303 0.0047
L302 220µ
L303 220µ
D302 MA150
D301 MA150
R3161 100
R3101 560
R3102 680
L309 220µ
L326 220µ
R3130 1K
Q322 2SC828
L324 33µ
C396 330P
R3131 82
R368 6800
R369 10K
C353 0.01
C379 50V1
R3100 470K
C380 10V47
J6
J7
C394 18P
C395 39P
R3132 330
FL303 VLF0060
R3127 1000
R3126 1000
C381 330P
TP308
R373 680
C357 6V47
R376 4700
R375 3900
R372 560
FL306 VLF0069
C344 0.01
C358 6V220
R377 680
IC302 AN6321
R374 1000
C356 16V10
C382 100P
C3110 0.01
TP309
C387 100P
L315 1mH
L322 150µ
C388 430PJ
C389 82P
C391 82P
L323 47µ
L325 47µ
R3104 1000
L317 10µ
R3103 1000
DL301 EFDEN645A01
L316 560µ
R3106 390
C390 56P
C385 0.01
R3105 2200
R3107 390
R3109 15K
C386 0.01
R3108 15K
R3110 50KB
LIM BAL
L318 10µ
C383 0.01
C384 6V47
C360 0.001
C361 47P
R385 270
D309 0A90
R391 2200
R390 47K
C359 16V47
R3138 1200
R387 33K
C368 6V47
Q317 2SC828
C364 39P
R389 1500
L327 100µ
C363 82P
R386 15K
R388 1200
R384 56K
R383 2KB
VIDEO LEVEL
C369 68P
D310 0A90
C375 0.001
C374 390P
L314 100µ
C3123 27P
C3121 27P
T301 EIK10H2
R395 1000
R396 470
R393 820
L313 33µ
L312 39µ
C373 33P
P32
P33
P34
R305 10K
R365 82
C371 6V100
L310 220µ
TP314
Q313 2SC828
Q314 2SC828
R394 820
R398 5600
C378 6V47
Q312 2SC828
TP312
R371 1500
C366 16V10
C365 56P
C367 27P
R378 1800
C3125 33P
R392 560
R397 390
Q315 2SA564
R399 10K
C376 10V470
C377 6V470
C372 16V47
TP313
C354 16V47
C355 180P
L311 220µ
D308 MA150
FL305 VLF0061
R366 33K
R367 33K
GND
R381 1800
Q316 2SA564
R380 8200
R379 820
R382 330
C362 16V100
C370 0.01
D307 MA150

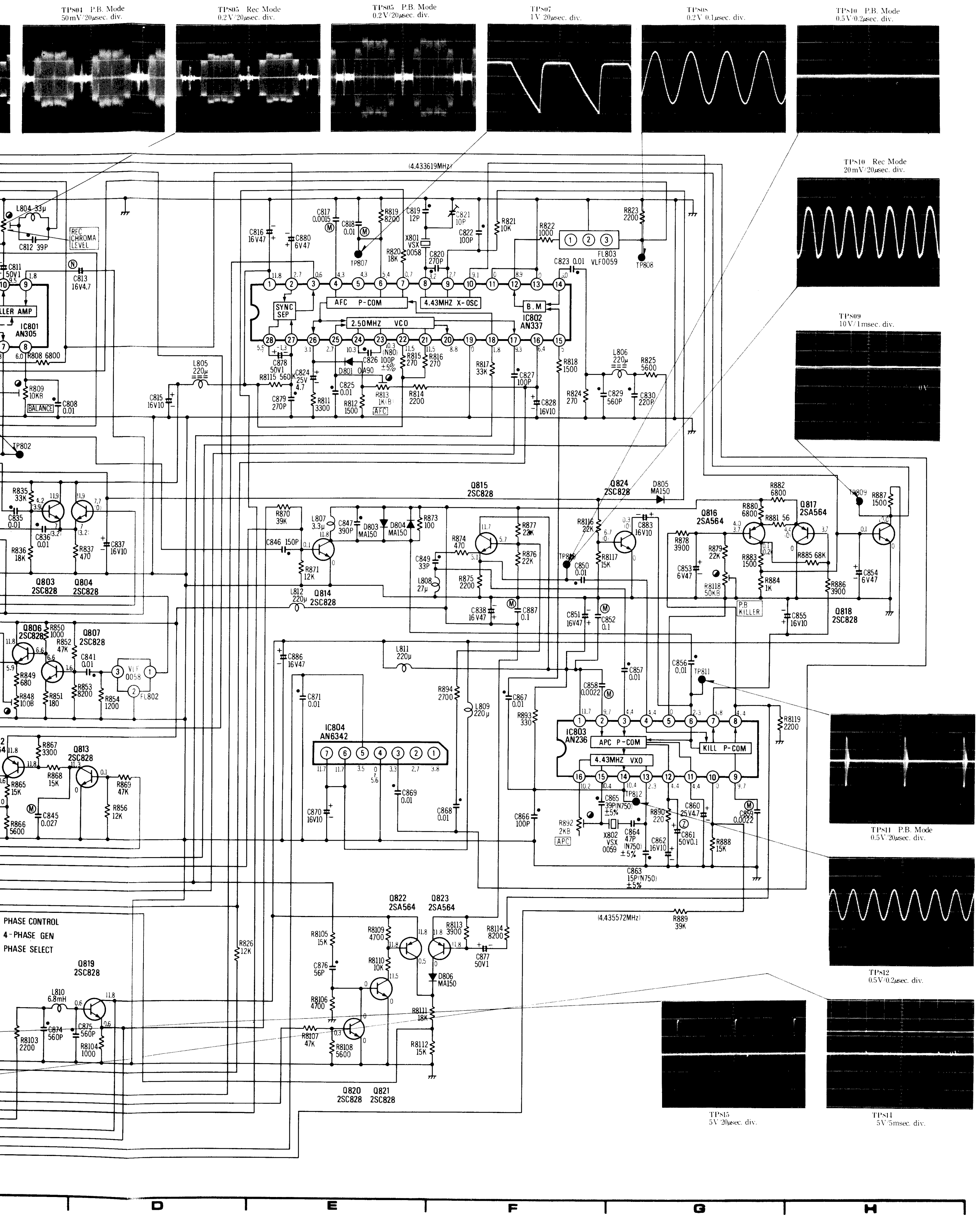
uminance Process rcuit Board	
301	C-3
302	D-3
303	D-3
304	D-3
305	E-3
306	E-3
307	E-4
308	E-4
309	B-2
310	C-3
311	C-3
312	C-1
313	B-1
314	C-1
315	C-1
316	D-1
317	F-1
318	B-4
319	B-4
320	B-4
321	F-3
322	F-3
323	F-3
324	F-4
325	F-4
326	F-4
327	F-3
328	F-3
C301	D-3
C302	E-2
C303	B-3
C304	F-4

COLOUR PROCESS SCHEMATIC DIAGRAM

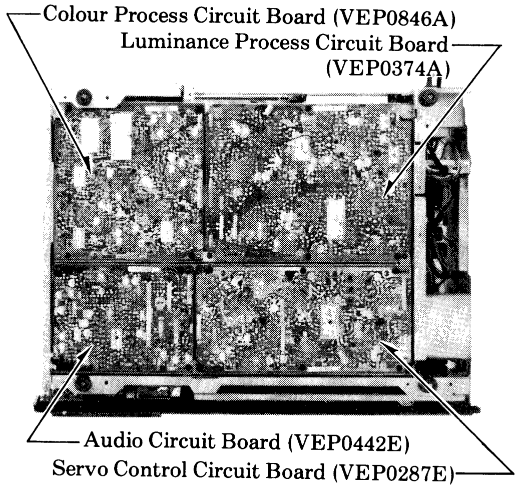


TP802 0.5V 20μsec. div.
TP803 0.2V 20μsec. div.
TP804 Rec Mode 50mV 20μsec. div.
TP804 P.B. Mode 50mV 20μsec. div.
TP805 Rec Mode 0.2V 20μsec. div.
TP805 P.B. Mode 0.2V/20μsec. div.
TP807 1V 20μsec. div.
TP808 0.2V 0.1μsec. div.
TP810 P.B. Mode 0.5V/0.2μsec. div.
TP810 Rec Mode 20mV 20μsec. div.
TP809 10V 1msec. div.
TP811 P.B. Mode 0.5V 20μsec. div.
TP812 0.5V 0.2μsec. div.
TP815 5V 20μsec. div.
TP814 5V 5msec. div.
J4
5 ACK OUT
4 PB CHROMA OUT
3 GND
2 +12V IN
1 CHROMA IN
J3
5 REC CHROMA OUT
4 EXCEPT REC +12V IN
3 REC +12 V IN
2 REF 50Hz OUT
1 VIDEO IN (HSS)
5 GND
4 ACC CHROMA OUT
3 REC ACK IN
2 BURST GATE PULES OUT
1 2μ PULSE OUT
J2
J1
5 GND
4 +12V IN
3 VSS OUT
2 DROPOUT DETECT IN
1 PG (25Hz) IN
IC801 AN305
BURST GATE
DETECT
ACC
KILLER AMP
BAL MOD
P.B. CHROMA LEVEL
REC CHROMA LEVEL
BALANCE
IC802 AN337
SYNC SEP
AFC P-COM
4.43MHZ X-OSC
2.50MHZ VCO
B.M
(4.433619MHz)
FL803 VLF0059
X801 VSX 0058
AFC
FL801 VLF6
Q802 2SC828
Q803 2SC828
Q804 2SC828
DL801 EFDHN124A11A (2HDL)
T801 EIK105572Z
T802 EIK105572Z
MIX LEVEL
Q805 2SC828
Q806 2SC828
Q807 2SC828
VLF 0058
FL802
Q815 2SC828
Q814 2SC828
Q824 2SC828
Q816 2SA564
Q817 2SA564
Q818 2SC828
P.B. KILLER
IC804 AN6342
IC803 AN236
APC P-COM
KILL P-COM
4.43MHZ VXO
X802 VSX 0059
APC
(4.435572MHz)
Q809 2SC828
Q808 2SC828
Q810 2SC828
Q811 2SC828
Q812 2SA564
Q813 2SC828
IC805 AN6061A
1/40
AMP
※3
※2
※1
HD2
HD1
※1 PHASE CONTROL
※2 4-PHASE GEN
※3 PHASE SELECT
2 μS PULSE
Q819 2SC828
Q822 2SA564
Q823 2SA564
Q820 2SC828
Q821 2SC828
6
5
4
3
2
1
A
B
C
D
E
F
G
H

TIC DIAGRAM



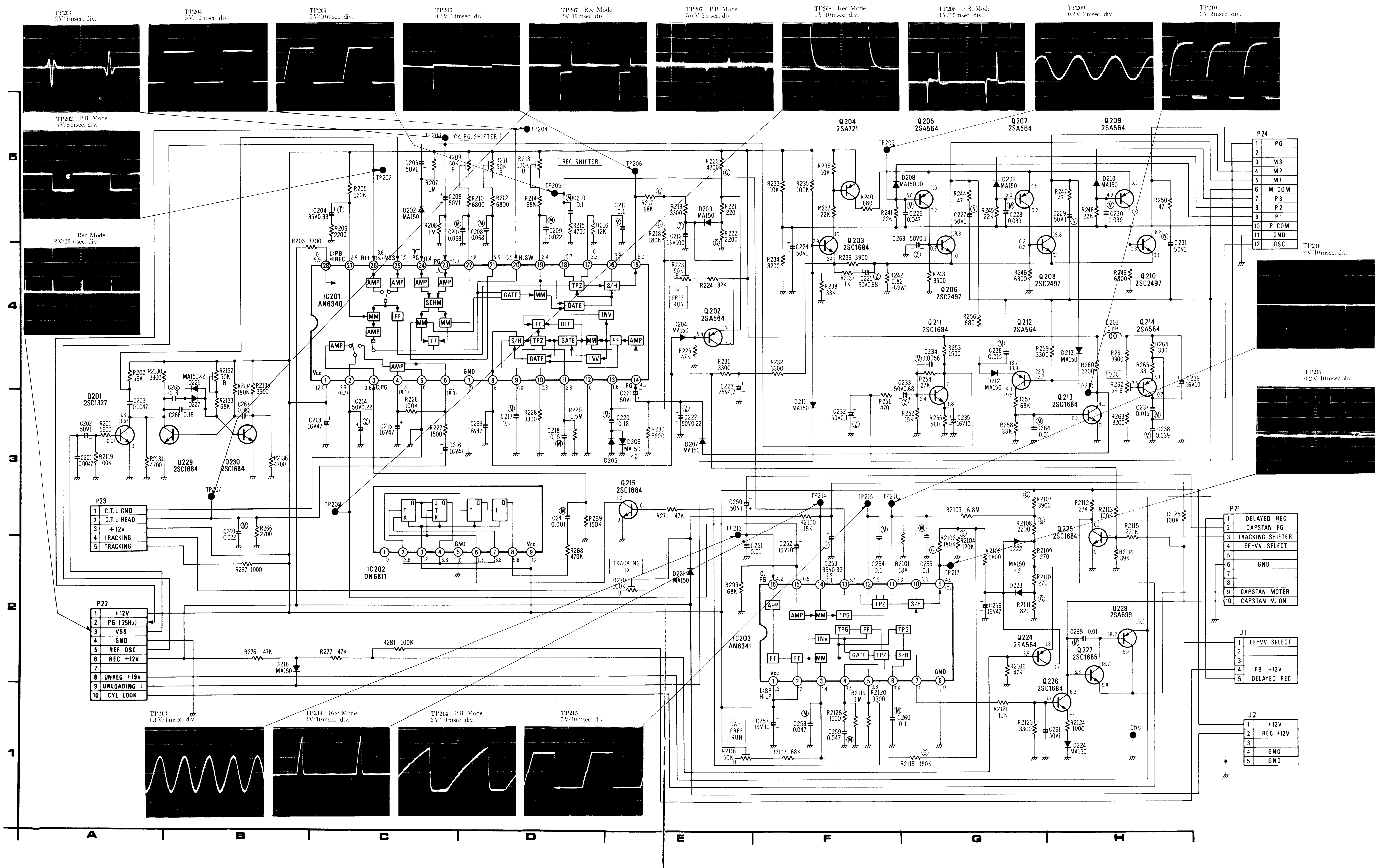
TP801 P.B. Mode 50mV/20μsec. div.
TP805 Rec Mode 0.2V/20μsec. div.
TP805 P.B. Mode 0.2V/20μsec. div.
TP807 1V/20μsec. div.
TP808 0.2V/0.1μsec. div.
TP810 P.B. Mode 0.5V/0.2μsec. div.
TP810 Rec Mode 20mV/20μsec. div.
TP809 10V/1msec. div.
TP811 P.B. Mode 0.5V/20μsec. div.
TP812 0.5V/0.2μsec. div.
TP815 5V/20μsec. div.
TP814 5V/5msec. div.
(4.433619MHz)
(4.435572MHz)
IC801 AN305
IC802 AN337
IC803 AN236
IC804 AN6342
SYNC SEP
AFC P-COM
4.43MHZ X-OSC
2.50MHZ VCO
B.M
APC P-COM
4.43MHZ VXO
KILL P-COM
REC CHROMA LEVEL
BALANCE
P.B. KILLER
FL803 VLF0059
X801 VSX 0058
X802 VSX 0059
Q803 2SC828
Q804 2SC828
Q806 2SC828
Q807 2SC828
Q813 2SC828
Q814 2SC828
Q815 2SC828
Q816 2SA564
Q817 2SA564
Q818 2SC828
Q819 2SC828
Q820 2SC828
Q821 2SC828
Q822 2SA564
Q823 2SA564
Q824 2SC828
D805 MA150
D806 MA150
PHASE CONTROL
4-PHASE GEN
PHASE SELECT
D
E
F
G
H



Colour Process Circuit Board (VEP0846A)
Luminance Process Circuit Board (VEP0374A)
Audio Circuit Board (VEP0442E)
Servo Control Circuit Board (VEP0287E)

Colour Process Circuit Board	
Q802	C-4
Q803	D-4
Q804	D-4
Q805	C-4
Q806	C-3
Q807	C-3
Q808	D-4
Q809	D-3
Q810	D-3
Q811	D-3
Q812	D-3
Q813	D-3
Q814	C-1
Q815	B-2
Q816	B-1
Q817	B-1
Q818	C-1
Q819	B-3
Q820	B-2
Q821	B-2
Q822	B-2
Q823	B-2
Q824	D-1
IC801	D-1
IC802	A-4
IC803	A-1
IC804	B-4
IC805	A-3

SERVO CONTROL SCHEMATIC DIAGRAM



TP203 2V/5msec. div.
TP204 5V/10msec. div.
TP205 5V/10msec. div.
TP206 0.2V/10msec. div.
TP207 Rec Mode 2V/10msec. div.
TP207 P.B. Mode 5mV/5msec. div.
TP208 Rec Mode 1V/10msec. div.
TP208 P.B. Mode 1V/10msec. div.
TP209 0.2V/2msec. div.
TP210 2V/2msec. div.
TP202 P.B. Mode 5V/5msec. div.
Rec Mode 2V/10msec. div.
TP216 2V/10msec. div.
TP217 0.2V/10msec. div.
TP213 0.1V/1msec. div.
TP214 Rec Mode 2V/10msec. div.
TP214 P.B. Mode 2V/10msec. div.
TP215 5V/10msec. div.
CY. PG. SHIFTER
REC SHIFTER
IC201 AN6340
IC202 DN6811
IC203 AN6341
Q201 2SC1327
Q229 2SC1684
Q230 2SC1684
Q202 2SA564
Q203 2SC1684
Q204 2SA721
Q205 2SA564
Q206 2SC2497
Q207 2SA564
Q208 2SC2497
Q209 2SA564
Q210 2SC2497
Q211 2SC1684
Q212 2SA564
Q213 2SC1684
Q214 2SA564
Q215 2SC1684
Q224 2SA564
Q225 2SC1684
Q226 2SC1684
Q227 2SC1685
Q228 2SA699
CY. FREE RUN
TRACKING FIX
CAP. FREE RUN
OSC
P24
1 PG
2
3 M3
4 M2
5 M1
6 M COM
7 P3
8 P2
9 P1
10 P COM
11 GND
12 OSC
P23
1 C.T.L GND
2 C.T.L HEAD
3 +12V
4 TRACKING
5 TRACKING
P22
1 +12V
2 PG (25Hz)
3 VSS
4 GND
5 REF OSC
6 REC +12V
7
8 UNREG +19V
9 UNLOADING L
10 CYL LOOK
P21
1 DELAYED REC
2 CAPSTAN FG
3 TRACKING SHIFTER
4 EE-VV SELECT
5
6 GND
7
8
9 CAPSTAN MOTER
10 CAPSTAN M. ON
J1
1 EE-VV SELECT
2
3
4 PB +12V
5 DELAYED REC
J2
1 +12V
2 REC +12V
3
4 GND
5 GND
A
B
C
D
E
F
G
H
1
2
3
4
5

SERVO CONTROL CIRCUIT BOARD (VEP0287E)

P21 (Servo Control)

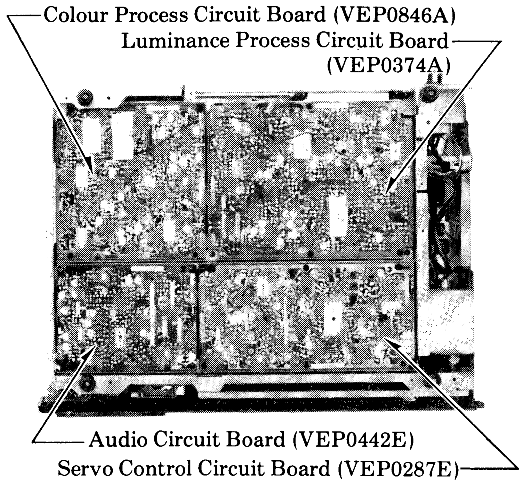
PIN NO.	SIGNAL NAME	DESTINATION
1	Delayed Rec	P32-7 (Luminance Process)
2	Capstan Fg	P605-1 (Capstan Motor)
3	Tracking Shifter	—
4	E-E, V-V Select	P32-9 (Luminance Process)
5	—	—
6	Gnd	P32-6 (Luminance Process)
7	—	—
8	—	—
9	Capstan Motor	P605-4 (Capstan Motor)
10	Capstan M. On	P65-3 (Transport Circuit)

P22 (Servo Control)

PIN NO.	SIGNAL NAME	DESTINATION
1	+12V	P62-9 (Transport Circuit)
2	PG (25Hz)	P32-5 (Luminance Process)
3	Vss	P32-3 (Luminance Process)
4	Gnd	P65-6 (Transport Circuit)
5	Ref OSC	P32-1 (Luminance Process)
6	Rec +12V	P32-8 (Luminance Process)
7	—	—
8	Unreg +19V	P65-1 (Transport Circuit)
9	Unloading Ⓛ	P63-1 (Transport Circuit)
10	Cyl Look	P65-2 (Transport Circuit)

P23 (Servo Control)

PIN NO.	SIGNAL NAME	DESTINATION
1	C.T.L. Gnd	P612-2 (A/C Head Connection)
2	C.T.L. Head	P612-1 (A/C Head Connection)
3	+12V	P614-1 (Reel Sensor)
4	Tracking	R6301 (Tracking)
5	Tracking	R6301 (Tracking)


Colour Process Circuit Board (VEP0846A)
Luminance Process Circuit Board (VEP0374A)
Audio Circuit Board (VEP0442E)
Servo Control Circuit Board (VEP0287E)

Servo Control Circuit Board	
Q201	D-1
Q202	D-3
Q203	E-1
Q204	E-2
Q205	F-3
Q206	F-2
Q207	F-3
Q208	F-1
Q209	F-3
Q210	F-1
Q211	E-2
Q212	F-1
Q213	E-1
Q214	F-3
Q215	C-2
Q224	B-3
Q225	C-1
Q226	A-1
Q227	B-1
Q228	B-2

J1

1	EE-VV SELECT
2	
3	
4	PB +12
5	DELAYED REC

J2

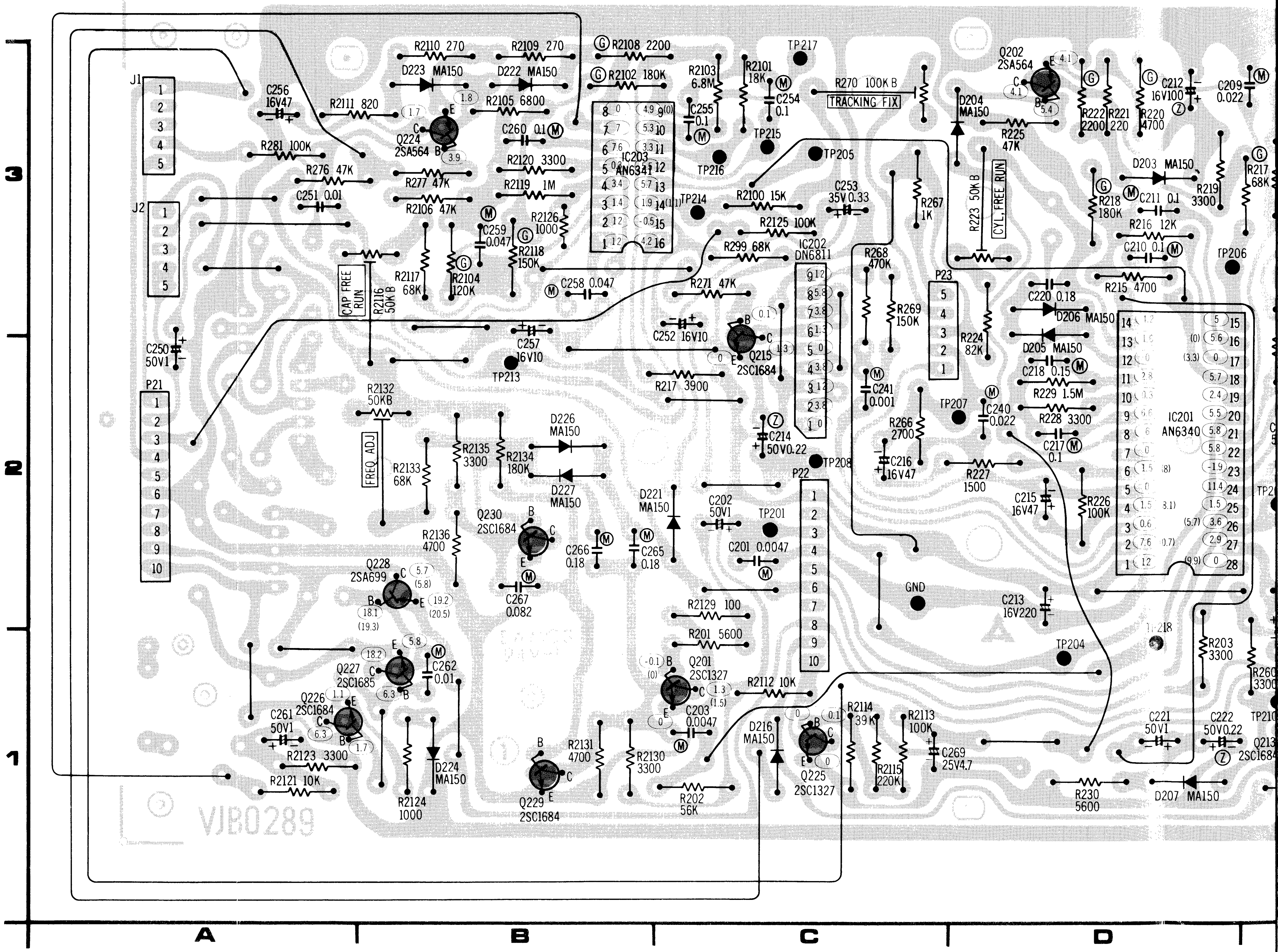
1	+12
2	REC +12
3	
4	GND
5	GND

P21

1	DELAYED REC
2	CAPSTAN FG
3	TRACKING SHIFTER
4	EE-VV SELECT
5	
6	GND
7	
8	
9	CAPSTAN MOTER
10	CAPSTAN M. ON

P23

1	C.T.L GND
2	C.T.L HEAD
3	+12V
4	TRACKING
5	TRACKING


3
2
1
A
B
C
D
J1
J2
P21
P22
P23
IC201 AN6340
IC202 DN6811
IC203 AN6341
Q201 2SC1327
Q202 2SA564
Q215 2SC1684
Q224 2SA564
Q225 2SC1327
Q226 2SC1684
Q227 2SC1685
Q228 2SA699
Q229 2SC1684
Q230 2SC1684
D203 MA150
D204 MA150
D205 MA150
D206 MA150
D207 MA150
D216 MA150
D221 MA150
D222 MA150
D223 MA150
D224 MA150
D226 MA150
D227 MA150
TRACKING FIX
CYL FREE RUN
CAP FREE RUN
FREQ ADJ
R270 100K B
R223 50K B
R2116 50K B
R2132 50KB
TP201
TP204
TP205
TP206
TP207
TP208
TP213
TP214
TP215
TP216
TP217
GND
VJB0289

RVO CONTROL CIRCUIT BOARD (VEP0287E)

J1

1	EE-VV SELECT
2	
3	
4	PB +12
5	DELAYED REC

J2

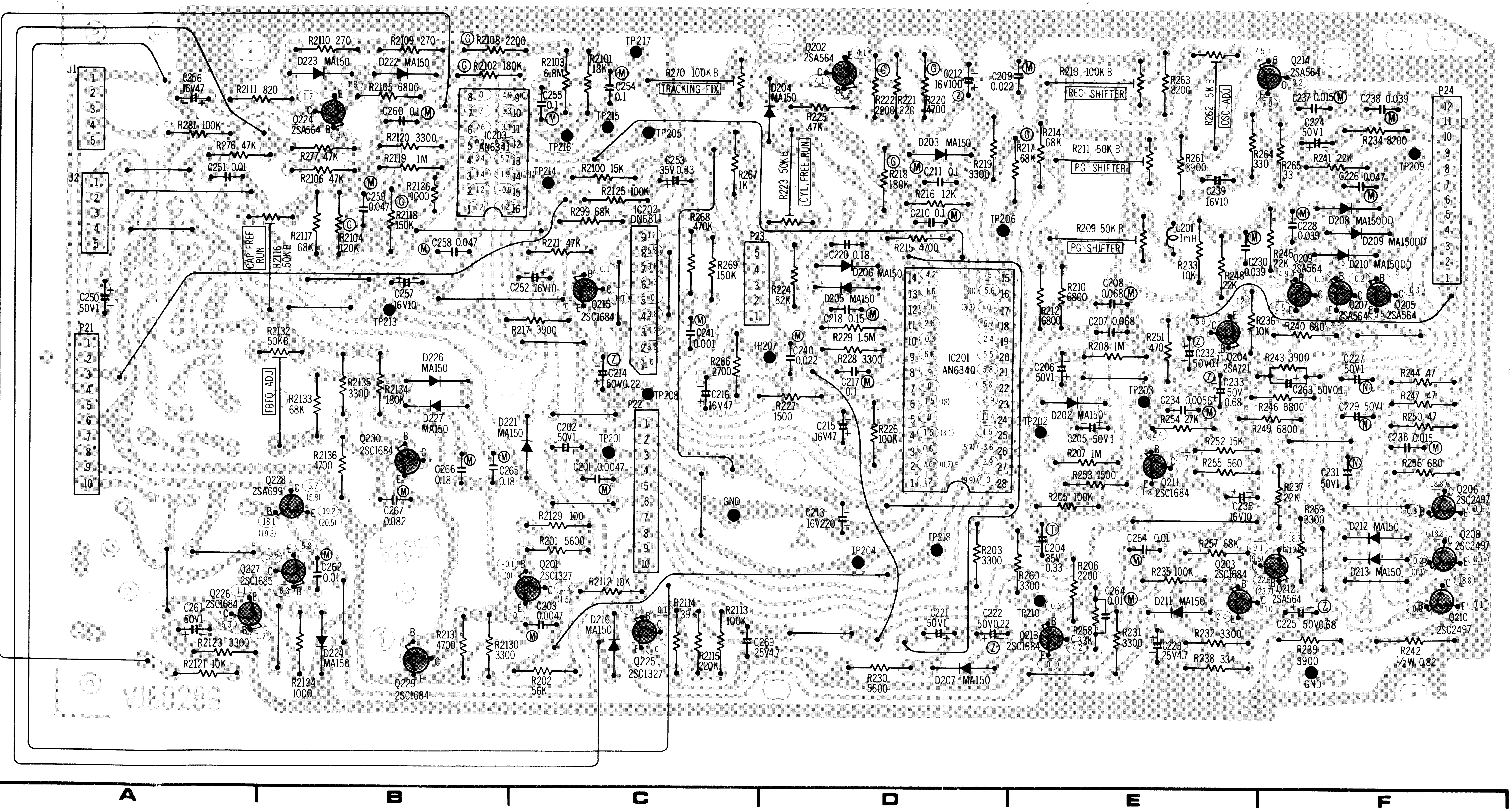
1	+12
2	REC +12
3	
4	GND
5	GND

P21

1	DELAYED REC
2	CAPSTAN FG
3	TRACKING SHIFTER
4	EE-VV SELECT
5	
6	GND
7	
8	
9	CAPSTAN MOTER
10	CAPSTAN M. ON

P23

1	C.T.L GND
2	C.T.L HEAD
3	+12V
4	TRACKING
5	TRACKING



J1
J2
P21
P22
P23
P24
IC201 AN6340
IC202 DN6811
IC203 AN6341
TRACKING FIX
CYL. FREE RUN
REC SHIFTER
PG SHIFTER
OSC ADJ
CAP FREE RUN
FREQ ADJ
R2132 50KB
R223 50KB
R213 100KB
R211 50KB
R209 50KB
R270 100KB
R262 5KB
L201 1mH
TP201
TP202
TP203
TP204
TP205
TP206
TP207
TP208
TP209
TP210
TP213
TP214
TP215
TP216
TP217
TP218
GND
EAMC3 94V-1
VJE0289
A
B
C
D
E
F

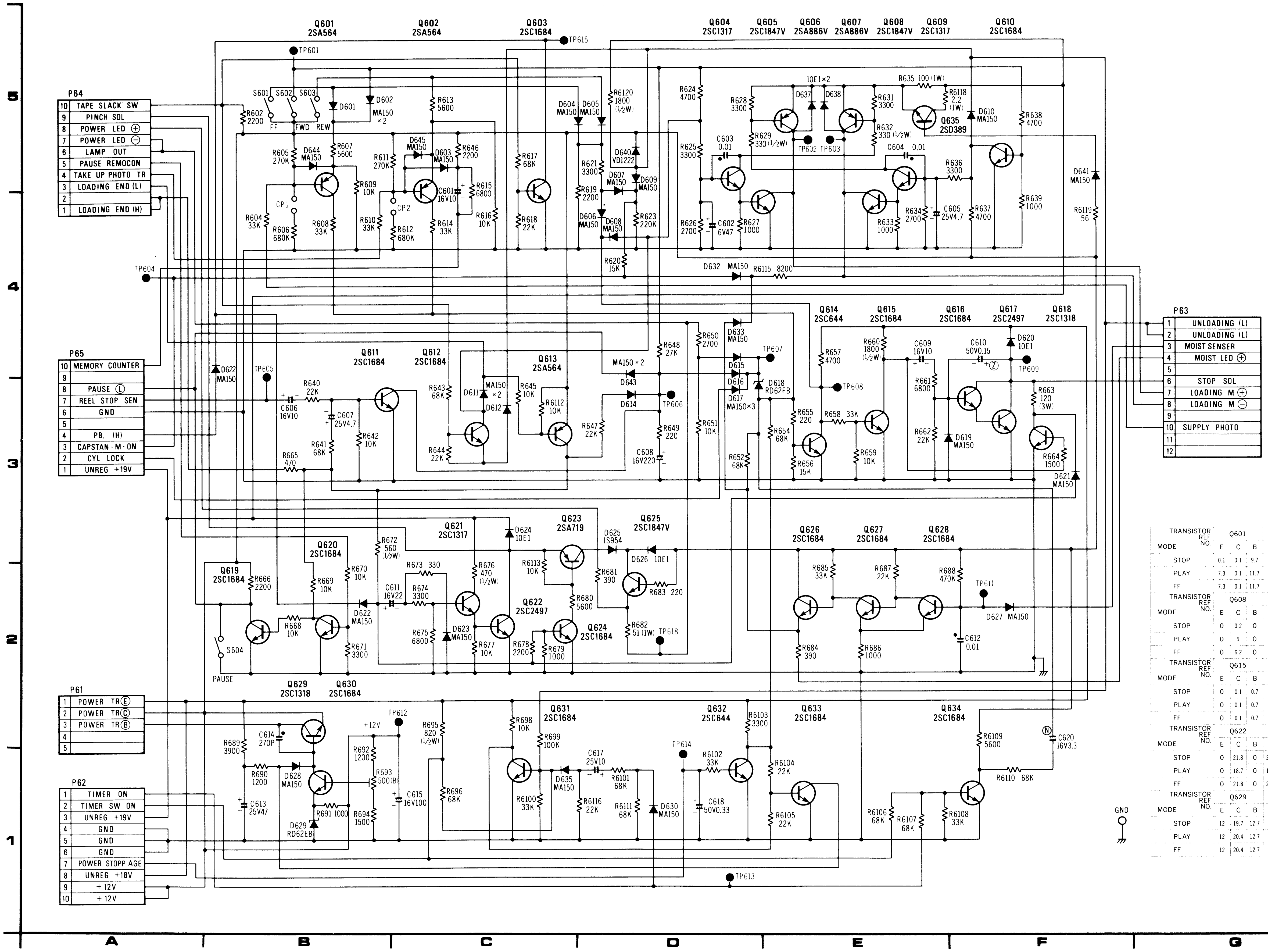
P24

1	PG
2	
3	M3
4	M2
5	M1
6	M COM
7	P3
8	P2
9	P1
10	P COM
11	GND
12	OSC

P22

1	+12V
2	PG (25Hz)
3	VSS
4	GND
5	REF OSC
6	REC +12V
7	
8	UNLOADING +19V
9	UNLOADING L
10	CYL LOOK

REGULATOR & TRANSPORT SCHEMATIC DIAGRAM


Q601 2SA564
Q602 2SA564
Q603 2SC1684
Q604 2SC1317
Q605 2SC1847V
Q606 2SA886V
Q607 2SA886V
Q608 2SC1847V
Q609 2SC1317
Q610 2SC1684
Q611 2SC1684
Q612 2SC1684
Q613 2SA564
Q614 2SC644
Q615 2SC1684
Q616 2SC1684
Q617 2SC2497
Q618 2SC1318
Q619 2SC1684
Q620 2SC1684
Q621 2SC1317
Q622 2SC2497
Q623 2SA719
Q624 2SC1684
Q625 2SC1847V
Q626 2SC1684
Q627 2SC1684
Q628 2SC1684
Q629 2SC1318
Q630 2SC1684
Q631 2SC1684
Q632 2SC644
Q633 2SC1684
Q634 2SC1684
Q635 2SD389
P64
10 TAPE SLACK SW
9 PINCH SOL
8 POWER LED ⊕
7 POWER LED ⊖
6 LAMP OUT
5 PAUSE REMOCON
4 TAKE UP PHOTO TR
3 LOADING END (L)
2
1 LOADING END (H)
P65
10 MEMORY COUNTER
9
8 PAUSE Ⓛ
7 REEL STOP SEN
6 GND
5
4 PB. (H)
3 CAPSTAN・M・ON
2 CYL LOCK
1 UNREG +19V
P61
1 POWER TRⒺ
2 POWER TRⒸ
3 POWER TRⒷ
4
5
P62
1 TIMER ON
2 TIMER SW ON
3 UNREG +19V
4 GND
5 GND
6 GND
7 POWER STOPP AGE
8 UNREG +18V
9 +12V
10 +12V
P63
1 UNLOADING (L)
2 UNLOADING (L)
3 MOIST SENSER
4 MOIST LED ⊕
5
6 STOP SOL
7 LOADING M ⊕
8 LOADING M ⊖
9
10 SUPPLY PHOTO
11
12
TP601
TP602
TP603
TP604
TP605
TP606
TP607
TP608
TP609
TP611
TP612
TP613
TP614
TP615
TP618
S601
S602
S603
FF
FWD
REW
S604
PAUSE
CP1
CP2
D601
D602 MA150 ×2
D603 MA150
D604 MA150
D605 MA150
D606 MA150
D607 MA150
D608 MA150
D609 MA150
D610 MA150
D611 MA150 ×2
D612
D614
D615
D616
D617 MA150×3
D618 RD62EB
D619 MA150
D620 10E1
D621 MA150
D622 MA150
D623 MA150
D624 10E1
D625 1S954
D626 10E1
D627 MA150
D628 MA150
D629 RD62EB
D630 MA150
D632 MA150
D633 MA150
D635 MA150
D637
D638
10E1×2
D640 VD1222
D641 MA150
D643
MA150 × 2
D644 MA150
D645 MA150
R602 2200
R604 33K
R605 270K
R606 680K
R607 5600
R608 33K
R609 10K
R610 33K
R611 270K
R612 680K
R613 5600
R614 33K
R615 6800
R616 10K
R617 68K
R618 22K
R619 2200
R620 15K
R621 3300
R623 220K
R624 4700
R625 3300
R626 2700
R627 1000
R628 3300
R629 330 (1/2W)
R631 3300
R632 330 (1/2W)
R633 1000
R634 2700
R635 100 (1W)
R636 3300
R637 4700
R638 4700
R639 1000
R640 22K
R641 68K
R642 10K
R643 68K
R644 22K
R645 10K
R646 2200
R647 22K
R648 27K
R649 220
R650 2700
R651 10K
R652 68K
R654 68K
R655 220
R656 15K
R657 4700
R658 33K
R659 10K
R660 1800 (1/2W)
R661 6800
R662 22K
R663 120 (3W)
R664 1500
R665 470
R666 2200
R668 10K
R669 10K
R670 10K
R671 3300
R672 560 (1/2W)
R673 330
R674 3300
R675 6800
R676 470 (1/2W)
R677 10K
R678 2200
R679 1000
R680 5600
R681 390
R682 51 (1W)
R683 220
R684 390
R685 33K
R686 1000
R687 22K
R688 470K
R689 3900
R690 1200
R691 1000
R692 1200
R693 500(B)
R694 1500
R695 820 (1/2W)
R696 68K
R698 10K
R699 100K
R6100 33K
R6101 68K
R6102 33K
R6103 3300
R6104 22K
R6105 22K
R6106 68K
R6107 68K
R6108 33K
R6109 5600
R6110 68K
R6111 68K
R6112 10K
R6113 10K
R6115 8200
R6116 22K
R6118 2.2 (1W)
R6119 56
R6120 1800 (1/2W)
C601 16V10
C602 6V47
C603 0.01
C604 0.01
C605 25V4.7
C606 16V10
C607 25V4.7
C608 16V220
C609 16V10
C610 50V0.15
C611 16V22
C612 0.01
C613 25V47
C614 270P
C615 16V100
C617 25V10
C618 50V0.33
C620 16V3.3
+12V
GND
A
B
C
D
E
F
G
1
2
3
4
5

TRANSISTOR REF NO. / MODE	Q601			Q602			Q603			Q604			Q605			Q606			Q6
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E
STOP	0.1	0.1	9.7	0	0.1	1.5	0	0	0.6	0	21.8	0.2	0	0.2	0	21.7	0.2	21.7	21.7
PLAY	7.3	0.1	11.7	0.1	0.1	9.5	0	11.3	0	0	20.3	0.2	0	6	0	20.3	6	20.3	20.3
FF	7.3	0.1	11.7	0.1	0.1	9.5	0	0	0.6	0	21.8	0.2	0	6.2	0	20.8	6	20.8	20.9

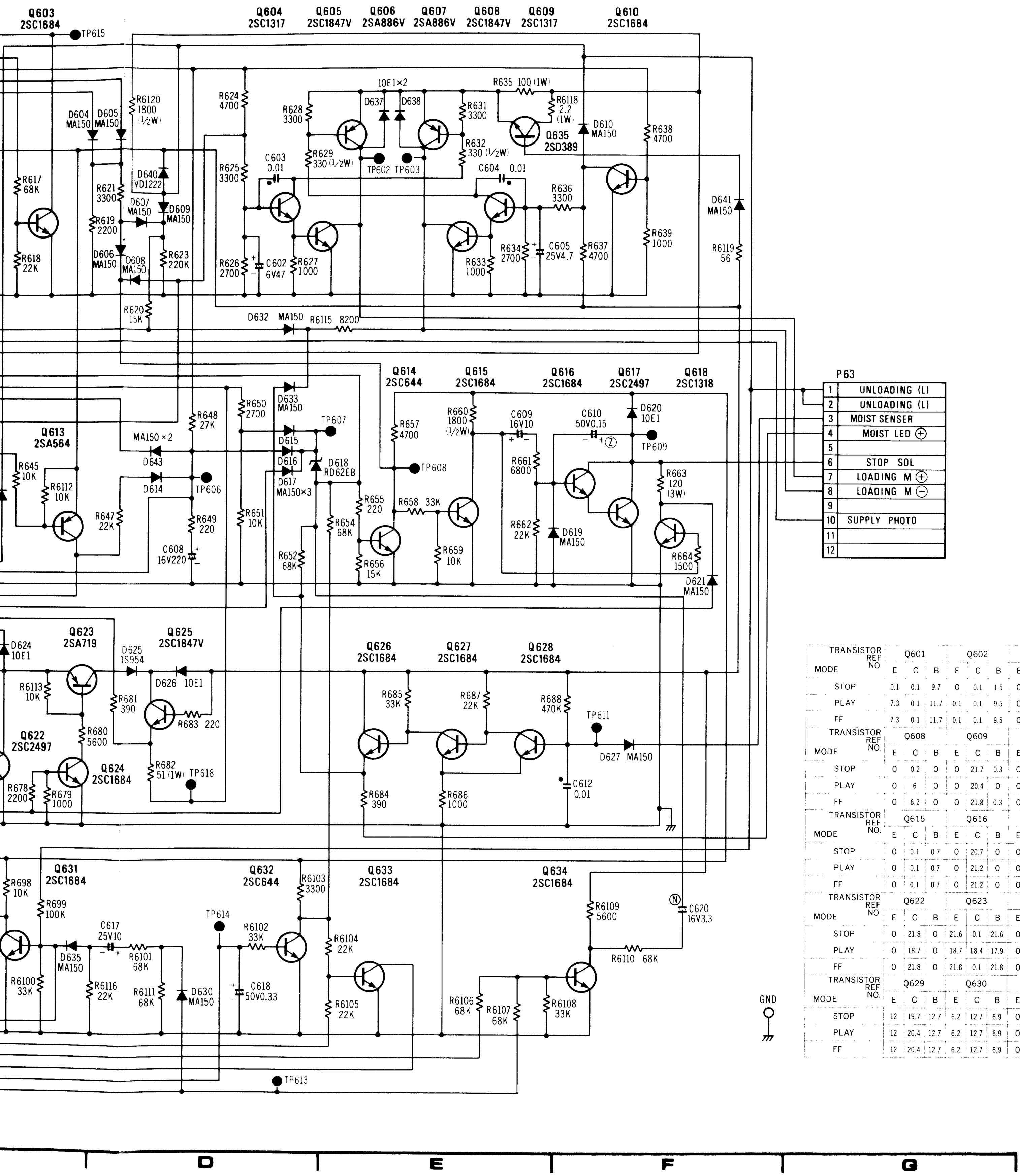
TRANSISTOR REF NO. / MODE	Q608			Q609			Q610			Q611			Q612			Q613			Q6
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E
STOP	0	0.2	0	0	21.7	0.3	0	0.7	0	0	0.2	0	0.4	0.4	1	12	0	12	0
PLAY	0	6	0	0	20.4	0	0	0	0.7	0	0～1.2	0～1.2	0	0.7	0	12	12	11.3	0
FF	0	6.2	0	0	21.8	0.3	0	0.7	0	0	0	-0.4	0.3	0.3	1	12	12	12	0

TRANSISTOR REF NO. / MODE	Q615			Q616			Q617			Q618			Q619			Q620			Q6
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E
STOP	0	0.1	0.7	0	20.7	0	0	20.7	0	0	20.4	0.1	0	0.1	0.7	0	0	0.7	0
PLAY	0	0.1	0.7	0	21.2	0	0	21.2	0	0	21.2	0.1	0	11.3	0	0	0	0.7	0
FF	0	0.1	0.7	0	21.2	0	0	21.2	0	0	21.2	0.1	0	0.1	0.7	0	6.4	0.7	0

TRANSISTOR REF NO. / MODE	Q622			Q623			Q624			Q625			Q626			Q627			Q6
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E
STOP	0	21.8	0	21.6	0.1	21.6	0	21.6	0	11	11.2	11.7	0.4	12	0.8	0.8	0.8	1.5	0.8
PLAY	0	18.7	0	18.7	18.4	17.9	0	0	0.8	11.2	17.7	11.8	0.4	12	0.8	0.8	0.8	1.5	0.8
FF	0	21.8	0	21.8	0.1	21.8	0	21.6	0	11	11.2	11.7	0.4	12	0.8	0.8	0.8	1.5	0.8

TRANSISTOR REF NO. / MODE	Q629			Q630			Q631			Q632			Q633			Q634		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	12	19.7	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	13.3	0.1	0	0	0.7
PLAY	12	20.4	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	13.3	0.1	0	0	0.7
FF	12	20.4	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	0.1	0.7	0	0	0.7

TIC DIAGRAM


Q603 2SC1684
TP615
Q604 2SC1317
Q605 2SC1847V
Q606 2SA886V
Q607 2SA886V
Q608 2SC1847V
Q609 2SC1317
Q610 2SC1684
R6120 1800 (1/2W)
D604 MA150
D605 MA150
R624 4700
10E1×2
D637
D638
R635 100 (1W)
R6118 2.2 (1W)
R628 3300
R631 3300
D610 MA150
Q635 2SD389
R638 4700
R632 330 (1/2W)
R629 330 (1/2W)
TP602
TP603
C603 0.01
R625 3300
D640 VD1222
R617 68K
R621 3300
D607 MA150
D609 MA150
R619 2200
C604 0.01
R636 3300
D641 MA150
R6119 56
R639 1000
R634 2700
C605 25V4.7
R637 4700
R633 1000
R618 22K
D606 MA150
D608 MA150
R623 220K
R626 2700
C602 6V47
R627 1000
R620 15K
D632 MA150
R6115 8200
Q614 2SC644
Q615 2SC1684
Q616 2SC1684
Q617 2SC2497
Q618 2SC1318
P63
1 UNLOADING (L)
2 UNLOADING (L)
3 MOIST SENSER
4 MOIST LED ⊕
5
6 STOP SOL
7 LOADING M ⊕
8 LOADING M ⊖
9
10 SUPPLY PHOTO
11
12
R650 2700
D633 MA150
R648 27K
TP607
R657 4700
R660 1800 (1/2W)
C609 16V10
C610 50V0.15
D620 10E1
TP609
Q613 2SA564
MA150×2
D643
D614
TP606
D615
D616
D617 MA150×3
D618 RD62EB
TP608
R661 6800
R663 120 (3W)
R645 10K
R6112 10K
R647 22K
R649 220
R651 10K
R655 220
R658 33K
R654 68K
R662 22K
D619 MA150
C608 16V220
R652 68K
R656 15K
R659 10K
R664 1500
D621 MA150
D624 10E1
Q623 2SA719
D625 1S954
Q625 2SC1847V
Q626 2SC1684
Q627 2SC1684
Q628 2SC1684
R6113 10K
D626 10E1
R685 33K
R687 22K
R688 470K
TP611
R681 390
R683 220
Q622 2SC2497
R680 5600
D627 MA150
Q624 2SC1684
R682 51 (1W)
TP618
C612 0.01
R678 2200
R679 1000
R684 390
R686 1000
R698 10K
Q631 2SC1684
Q632 2SC644
R6103 3300
Q633 2SC1684
Q634 2SC1684
R699 100K
TP614
C620 16V3.3
C617 25V10
R6102 33K
R6109 5600
R6101 68K
R6104 22K
D635 MA150
R6110 68K
R6100 33K
R6116 22K
R6111 68K
D630 MA150
C618 50V0.33
R6105 22K
R6106 68K
R6107 68K
R6108 33K
GND
TP613
D
E
F
G

TRANSISTOR REF NO. / MODE	Q601			Q602			Q603			Q604			Q605			Q606			Q607		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0.1	0.1	9.7	0	0.1	1.5	0	0	0.6	0	21.8	0.2	0	0.2	0	21.7	0.2	21.7	21.7	0.2	21.7
PLAY	7.3	0.1	11.7	0.1	0.1	9.5	0	11.3	0	0	20.3	0.2	0	6	0	20.3	6	20.3	20.3	0	20.3
FF	7.3	0.1	11.7	0.1	0.1	9.5	0	0	0.6	0	21.8	0.2	0	6.2	0	20.8	6	20.8	20.9	0	20.9

TRANSISTOR REF NO. / MODE	Q608			Q609			Q610			Q611			Q612			Q613			Q614		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.2	0	0	21.7	0.3	0	0.7	0	0	0.2	0	0.4	0.4	1	12	0	12	0	18.5	0.1
PLAY	0	6	0	0	20.4	0	0	0	0.7	0	0~1.2	0~1.2	0	0.7	0	12	12	11.3	0	18.5	0.1
FF	0	6.2	0	0	21.8	0.3	0	0.7	0	0	0	−0.4	0.3	0.3	1	12	12	12	0	18.5	0.1

TRANSISTOR REF NO. / MODE	Q615			Q616			Q617			Q618			Q619			Q620			Q621		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	0.1	0.7	0	20.7	0	0	20.7	0	0	20.4	0.1	0	0.1	0.7	0	0	0.7	0	21.8	0
PLAY	0	0.1	0.7	0	21.2	0	0	21.2	0	0	21.2	0.1	0	11.3	0	0	0	0.7	0	21.8	0
FF	0	0.1	0.7	0	21.2	0	0	21.2	0	0	21.2	0.1	0	0.1	0.7	0	6.4	0.7	0	21.8	0

TRANSISTOR REF NO. / MODE	Q622			Q623			Q624			Q625			Q626			Q627			Q628		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	0	21.8	0	21.6	0.1	21.6	0	21.6	0	11	11.2	11.7	0.4	12	0.8	0.8	0.8	1.5	0.8	1.5	0.5
PLAY	0	18.7	0	18.7	18.4	17.9	0	0	0.8	11.2	17.7	11.8	0.4	12	0.8	0.8	0.8	1.5	0.8	1.5	0.5
FF	0	21.8	0	21.8	0.1	21.8	0	21.6	0	11	11.2	11.7	0.4	12	0.8	0.8	0.8	1.5	0.8	1.5	0.5

TRANSISTOR REF NO. / MODE	Q629			Q630			Q631			Q632			Q633			Q634		
	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B	E	C	B
STOP	12	19.7	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	13.3	0.1	0	0	0.7
PLAY	12	20.4	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	13.3	0.1	0	0	0.7
FF	12	20.4	12.7	6.2	12.7	6.9	0	0	0.7	0	0.1	0.7	0	0.1	0.7	0	0	0.7

P61 (Regulator & Transport)

PIN NO.	SIGNAL NAME	DESTINATION
1	Power TR Ⓔ	P671-3
2	Power TR Ⓒ	P671-2
3	Power TR Ⓑ	P671-1
4	—	—
5	—	—

P62 (Regulator & Transport)

PIN NO.	SIGNAL NAME	DESTINATION
1	Timer On	P609-4 (Timer Section)
2	Timer SW On	P609-1 (Timer Section)
3	Unreg +19V	P11-2 (Power Supply)
4	Gnd	P602-3 (Mic Jack Connection)
5	Gnd	P11-7 (Power Supply)
6	Gnd	P605-5 (Capstan Motor)
7	Power Stop Age	P11-6 (Power Supply)
8	Unreg +18V	P11-1 (Power Supply)
9	Unreg +12V	P22-1 (Control Section)
10	Unreg +12V	P33-4 (Colour Processing Section)

P63 (Regulator & Transport)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unloading (L)	P606-3 (Leaf SW Connection)
2	Unloading (L)	P22-9 (Control Section)
3	Moist Senser	P607-3 (Loading Motor Connection)
4	Moist Lamp	P608-2 (Light Emitting Diode)
5	—	—
6	Stop Sol	P622-1 (Stop Solenoid)
7	Loading M ⊕	P607-1 (Loading Motor Connection)
8	Loading M ⊖	P607-2 (Loading Motor Connection)
9	—	—
10	Supply Photo	Q6302 (Supply Photo TR Connection)
11	—	—
12	—	—

P64 (Regulator & Transport)

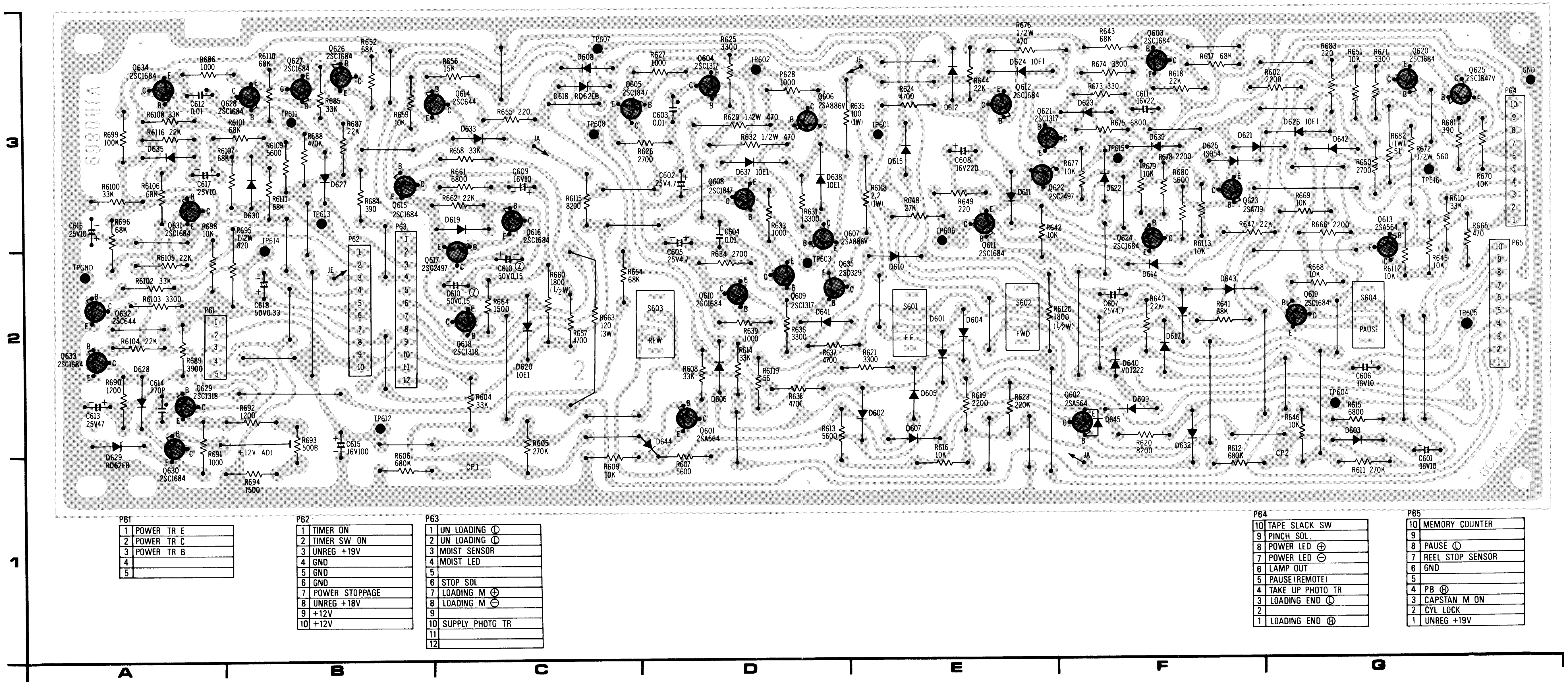
PIN NO.	SIGNAL NAME	DESTINATION
1	Loading End	P42-2 (Audio Section)
2	—	—
3	Loading End	P506-1 (Leaf SW Connection)
4	Take-up Photo TR	TP5303 (Take-up Photo TR Con.)
5	Pause Remote	P601-1 (Rear Jack Connection)
6	Lamp Out	P612-4 (AC Head Connection)
7	Power Led ⊖	P608-3 (Light Emitting Diode)
8	Power Led ⊕	P608-1 (Light Emitting Diode)
9	Pinch Sol	SL6302 (P. Solenoid)
10	Tape Slack SW	P613-3 (Micro Switch Connection)

P65 (Regulator & Transport)

PIN NO.	SIGNAL NAME	DESTINATION
1	Unreg +19V	P22-8 (Control Section)
2	Cyl Lock	P22-10 (Control Section)
3	Capstan M. On	P21-10 (Capstan Motor)
4	P.B. (H)	P44-4 (Audio Section)
5	—	—
6	Gnd	P22-4 (Control Section)
7	Reel Stop Sen	P614-3 (Reel Sensor Section)
8	Pause Ⓛ	P42-1 (Audio Section)
9	—	—
10	Memory Counter	S6307 (Memory Counter Switch)

Regulator & Transport Circuit Board	
Q601	D-2
Q602	F-2
Q603	F-3
Q604	D-3
Q605	C-3
Q606	D-3
Q607	D-3
Q608	D-3
Q609	D-2
Q610	D-2
Q611	E-3
Q612	E-3
Q613	G-3
Q614	C-3
Q615	B-3
Q616	C-3
Q617	C-3
Q618	C-2
Q619	G-2
Q620	G-3
Q621	E-3
Q622	E-3
Q623	F-3
Q624	F-3
Q625	G-3
Q626	B-3
Q627	B-3
Q628	B-3
Q629	A-2
Q630	A-2
Q631	A-3
Q632	A-2
Q633	A-2
Q634	A-3

REGULATOR & TRANSPORT CIRCUIT BOARD (VEP0669E1)


3
2
1
A
B
C
D
E
F
G
VJB0669
GCMK-47X
TPGND
GND
Q634 2SC1684
Q627 2SC1684
Q626 2SC1684
Q628 2SC1684
Q614 2SC644
Q605 2SC1847
Q604 2SC1317
Q606 2SA886V
Q612 2SC1684
Q603 2SC1684
Q621 2SC1317
Q620 2SC1684
Q625 2SC1847V
Q615 2SC1684
Q616 2SC1684
Q617 2SC2497
Q618 2SC1318
Q608 2SC1847
Q607 2SA886V
Q611 2SC1684
Q622 2SC2497
Q623 2SA719
Q624 2SC1684
Q613 2SA564
Q631 2SC1684
Q632 2SC644
Q633 2SC1684
Q629 2SC1318
Q630 2SC1684
Q610 2SC1684
Q609 2SC1317
Q635 2SD329
Q601 2SA564
Q602 2SA564
Q619 2SC1684
S603 REW
S601 FF
S602 FWD
S604 PAUSE
P61
P62
P63
P64
P65
CP1
CP2
+12V ADJ
R693 500B
C615 16V100
R606 680K
R694 1500
R691 1000
D629 RD62EB
R611 270K
C601 16V10
R612 680K

P61

1	POWER TR E
2	POWER TR C
3	POWER TR B
4	
5	

P62

1	TIMER ON
2	TIMER SW ON
3	UNREG +19V
4	GND
5	GND
6	GND
7	POWER STOPPAGE
8	UNREG +18V
9	+12V
10	+12V

P63

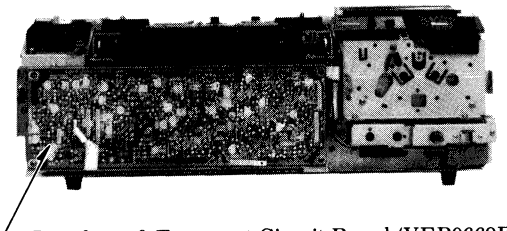
1	UN LOADING Ⓛ
2	UN LOADING Ⓛ
3	MOIST SENSOR
4	MOIST LED
5	
6	STOP SOL
7	LOADING M ⊕
8	LOADING M ⊖
9	
10	SUPPLY PHOTO TR
11	
12	

P64

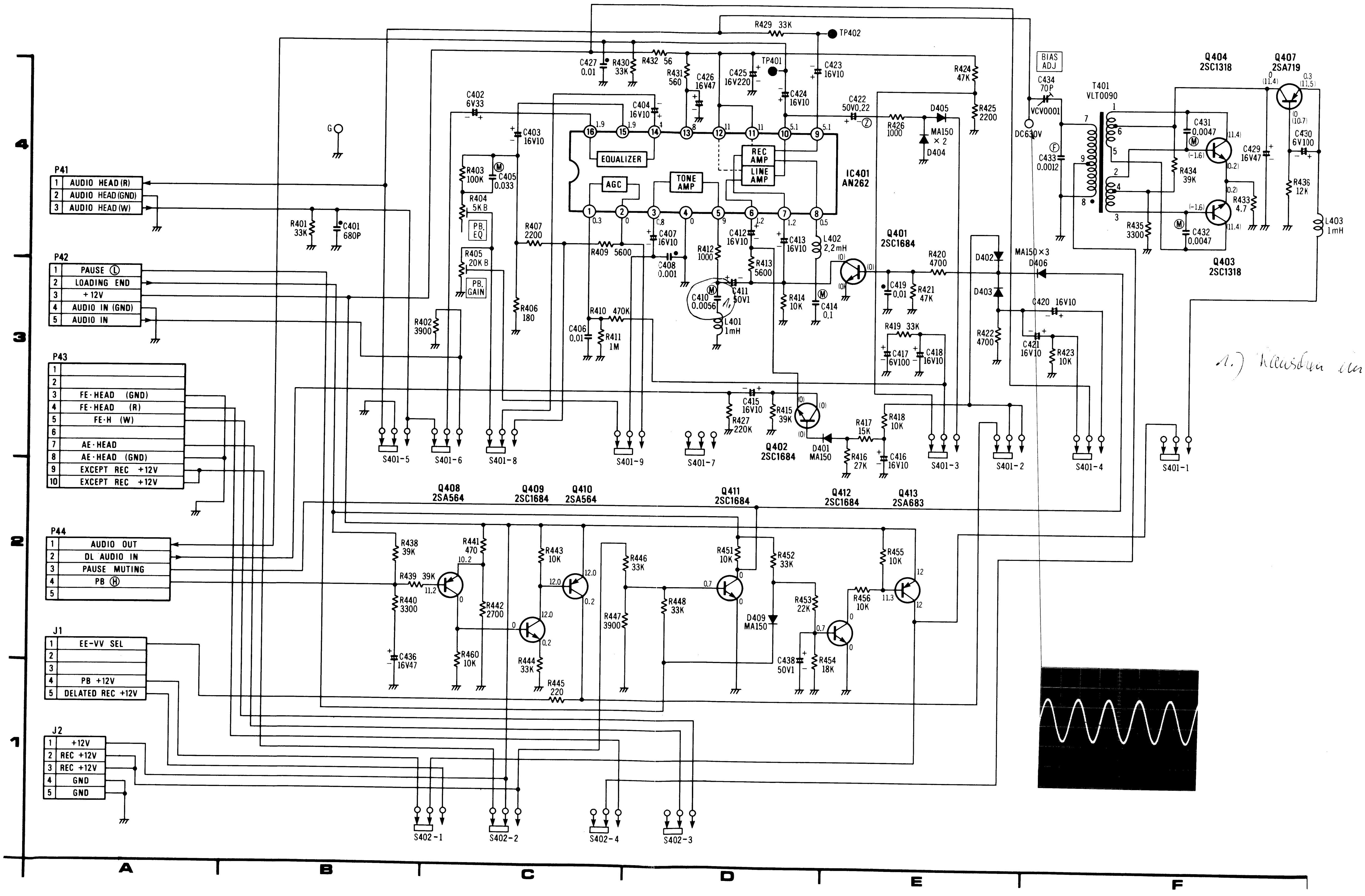
10	TAPE SLACK SW
9	PINCH SOL.
8	POWER LED ⊕
7	POWER LED ⊖
6	LAMP OUT
5	PAUSE (REMOTE)
4	TAKE UP PHOTO TR
3	LOADING END Ⓛ
2	
1	LOADING END Ⓗ

P65

10	MEMORY COUNTER
9	
8	PAUSE Ⓛ
7	REEL STOP SENSOR
6	GND
5	
4	PB Ⓗ
3	CAPSTAN M ON
2	CYL LOCK
1	UNREG +19V


Regulator & Transport Circuit Board (VEP0669E1)

AUDIO SCHEMATIC DIAGRAM


P41
1 AUDIO HEAD (R)
2 AUDIO HEAD (GND)
3 AUDIO HEAD (W)
P42
1 PAUSE Ⓛ
2 LOADING END
3 +12V
4 AUDIO IN (GND)
5 AUDIO IN
P43
3 FE·HEAD (GND)
4 FE·HEAD (R)
5 FE·H (W)
7 AE·HEAD
8 AE·HEAD (GND)
9 EXCEPT REC +12V
10 EXCEPT REC +12V
P44
1 AUDIO OUT
2 DL AUDIO IN
3 PAUSE MUTING
4 PB Ⓗ
J1
1 EE-VV SEL
4 PB +12V
5 DELATED REC +12V
J2
1 +12V
2 REC +12V
3 REC +12V
4 GND
5 GND
IC401 AN262
EQUALIZER
AGC
TONE AMP
REC AMP
LINE AMP
TP401
TP402
BIAS ADJ
T401 VLT0090
Q401 2SC1684
Q402 2SC1684
Q403 2SC1318
Q404 2SC1318
Q407 2SA719
Q408 2SA564
Q409 2SC1684
Q410 2SA564
Q411 2SC1684
Q412 2SC1684
Q413 2SA683
D401 MA150
D402
D403
D404
D405
MA150 × 2
MA150×3
D406
D409 MA150
L401 1mH
L402 2.2mH
L403 1mH
R401 33K
R402 3900
R403 100K
R404 5KB
R405 20KB
R406 180
R407 2200
R409 5600
R410 470K
R411 1M
R412 1000
R413 5600
R414 10K
R415 39K
R416 27K
R417 15K
R418 10K
R419 33K
R420 4700
R421 47K
R422 4700
R423 10K
R424 47K
R425 2200
R426 1000
R427 220K
R429 33K
R430 33K
R431 560
R432 56
R433 4.7
R434 39K
R435 3300
R436 12K
R438 39K
R439 39K
R440 3300
R441 470
R442 2700
R443 10K
R444 33K
R445 220
R446 33K
R447 3900
R448 33K
R451 10K
R452 33K
R453 22K
R454 18K
R455 10K
R456 10K
R460 10K
C401 680P
C402 6V33
C403 16V10
C404 16V10
C405 0.033
C406 0.01
C407 16V10
C408 0.001
C410 0.0056
C411 50V1
C412 16V10
C413 16V10
C414 0.1
C415 16V10
C416 16V10
C417 6V100
C418 16V10
C419 0.01
C420 16V10
C421 16V10
C422 50V0.22
C423 16V10
C424 16V10
C425 16V220
C426 16V47
C427 0.01
C429 16V47
C430 6V100
C431 0.0047
C432 0.0047
C433 0.0012
C434 70P
C436 16V47
C438 50V1
VCV0001
DC630V
PB. EQ
PB. GAIN
S401-1
S401-2
S401-3
S401-4
S401-5
S401-6
S401-7
S401-8
S401-9
S402-1
S402-2
S402-3
S402-4
A
B
C
D
E
F
1
2
3
4

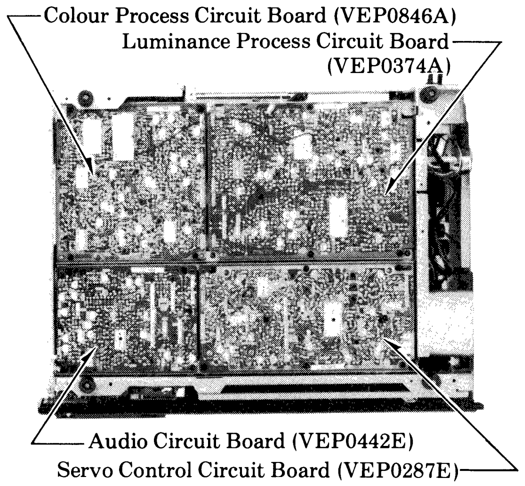
1.) Rauschen im Ton

P41 (Audio)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Audio Head (R)	(Audio/Control Head)
2	Audio Head (Gnd)	(Audio/Control Head)
3	Audio Head (W)	(Audio/Control Head)

P42 (Audio)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Pause Ⓛ	P65-8 (Transport Circuit)
2	Loading End	P64-1 (Transport Circuit)
3	+12V	—
4	Audio In (Gnd)	P602-1 (Mic Jack Connection)
5	Audio In	P602-2 (Mic Jack Connection)

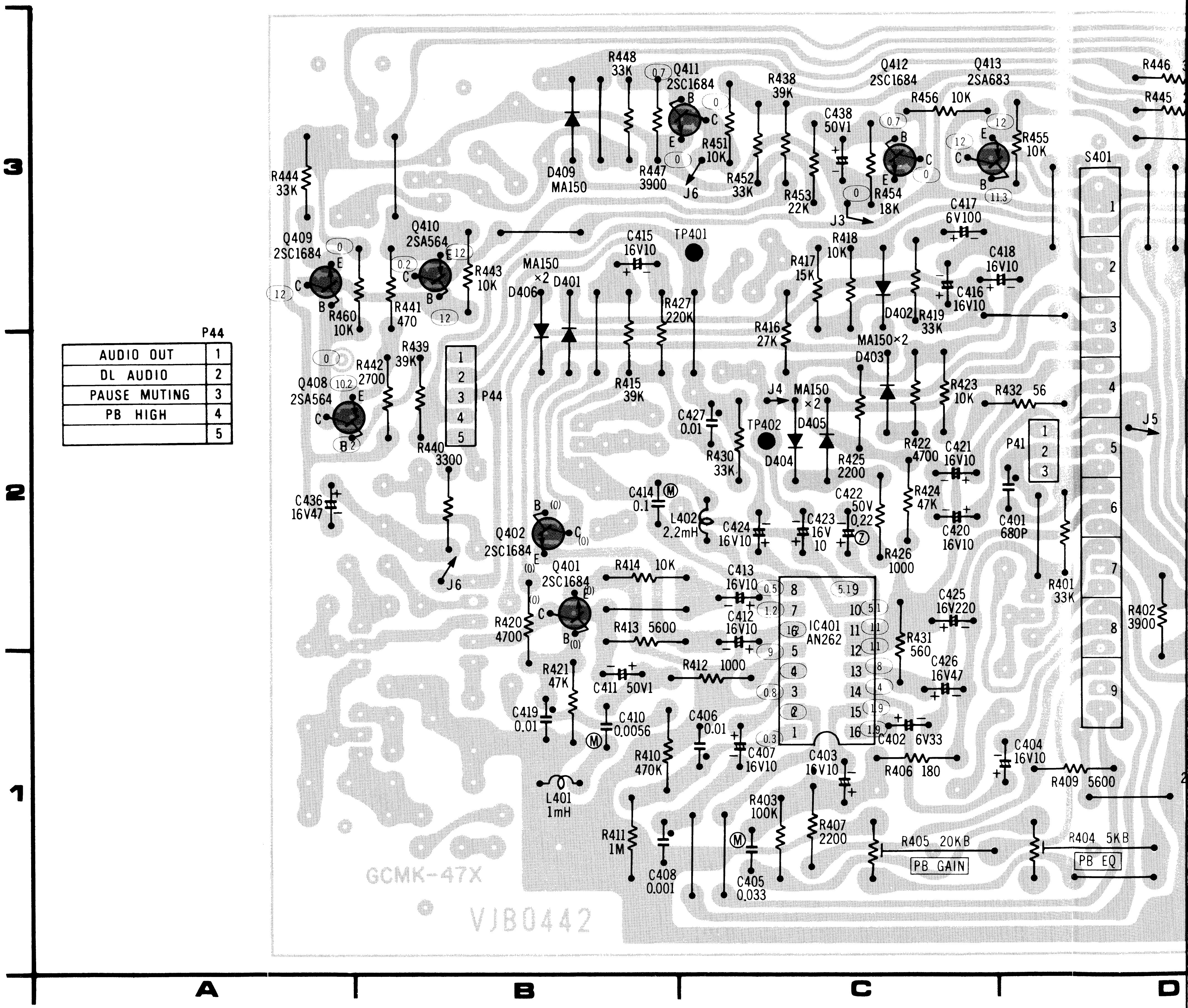
P43 (Audio)		
PIN NO.	SIGNAL NAME	DESTINATION
1	—	—
2	—	—
3	Fe. Head (Gnd)	(Full Erase Head)
4	Fe. Head (R)	(Full Erase Head)
5	Fe. Head (W)	(Full Erase Head)
6	—	—
7	Ae. Head	P612-5 (A/C Head Connection)
8	Ae. Head (Gnd)	P612-4 (A/C Head Connection)
9	Except Rec +12V	P32-2 (Luminance Process)
10	Except Rec +12V	P601-4 (Rear Jack Connection)

P44 (Audio)		
PIN NO.	SIGNAL NAME	DESTINATION
1	Audio Out	P601-2 (Rear Jack Connection)
2	D1 Audio Out	P604-1 (Input Selector)
3	Pause Muting	P32-10 (Luminance Process)
4	P.B. Ⓗ	P65-4 (Transport Circuit)
5	—	—


Colour Process Circuit Board (VEP0846A)
Luminance Process Circuit Board (VEP0374A)
Audio Circuit Board (VEP0442E)
Servo Control Circuit Board (VEP0287E)

Audio Circuit Board	
Q401	B-2
Q402	B-2
Q403	E-1
Q404	E-1
Q407	D-1
Q408	A-2
Q409	A-3
Q410	B-3
Q411	C-3
Q412	C-3
Q413	C-3

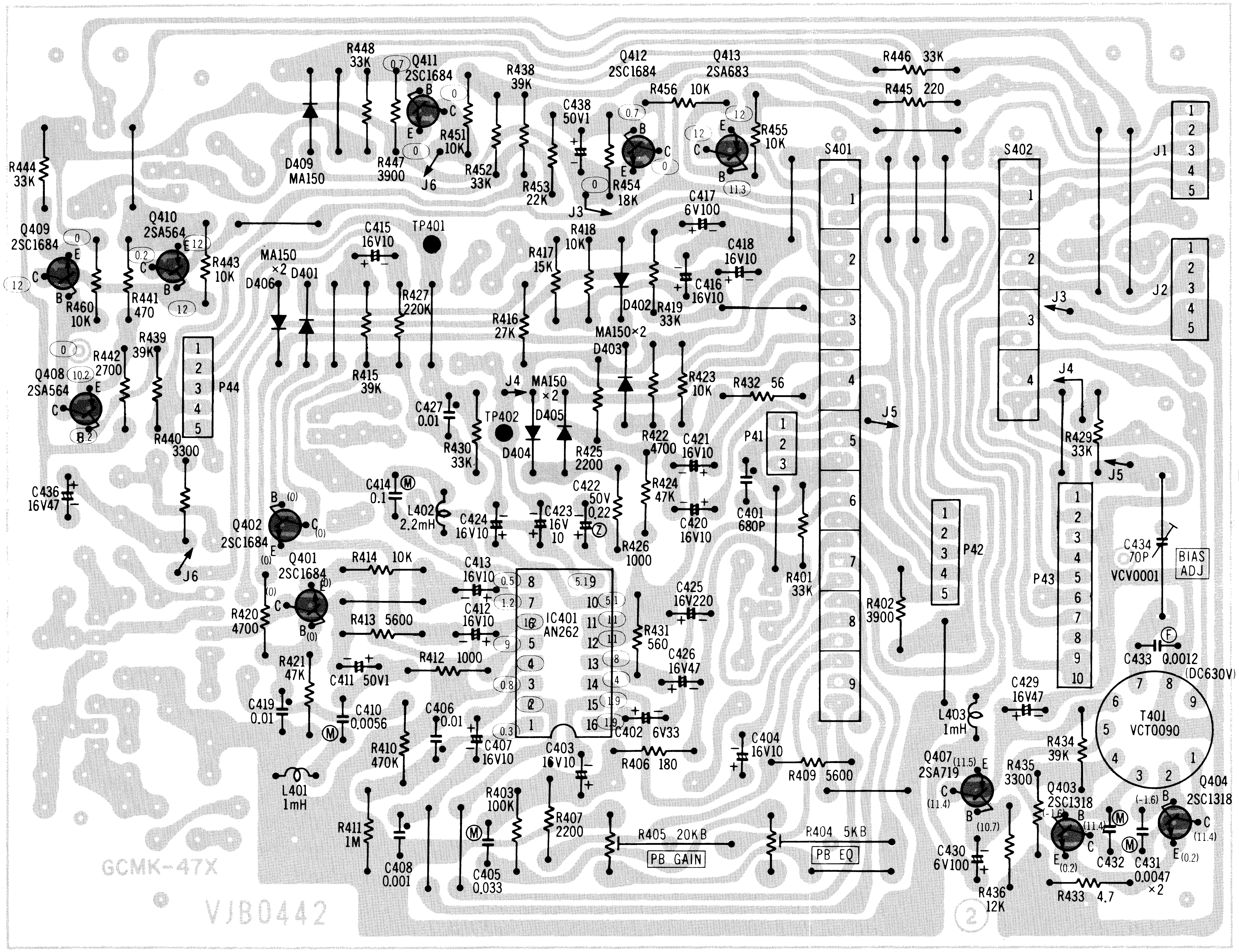
AUDIO CIRCUIT BOARD (VEP0442E)


3
2
1
A
B
C
D
P44
AUDIO OUT 1
DL AUDIO 2
PAUSE MUTING 3
PB HIGH 4
5
R448 33K
Q411 2SC1684
R438 39K
Q412 2SC1684
Q413 2SA683
R456 10K
R446
R445
C438 50V1
R455 10K
S401
R444 33K
D409 MA150
R447 3900
J6
R451 10K
R452 33K
R453 22K
J3
R454 18K
C417 6V100
Q409 2SC1684
Q410 2SA564
C415 16V10
TP401
R418 10K
C418 16V10
R443 10K
MA150 ×2
D406
D401
R417 15K
C416 16V10
R460 10K
R441 470
R427 220K
D402
R419 33K
R416 27K
MA150×2
D403
Q408 2SA564
R442 2700
R439 39K
R415 39K
J4
MA150 ×2
R423 10K
R432 56
J5
C427 0.01
TP402
D405
D404
R430 33K
R425 2200
R422 4700
C421 16V10
P41
R440 3300
C436 16V47
C414 0.1
L402 2.2mH
C424 16V10
C423 16V 10
C422 50V 0.22
R424 47K
C420 16V10
C401 680P
Q402 2SC1684
R426 1000
R401 33K
Q401 2SC1684
R414 10K
C413 16V10
IC401 AN262
C425 16V220
R402 3900
R420 4700
C412 16V10
R413 5600
R431 560
R421 47K
C411 50V1
R412 1000
C426 16V47
C419 0.01
C410 0.0056
C406 0.01
C407 16V10
C402 6V33
C404 16V10
R410 470K
C403 16V10
R406 180
R409 5600
L401 1mH
R403 100K
R411 1M
R407 2200
R405 20KB
R404 5KB
PB GAIN
PB EQ
C408 0.001
C405 0.033
GCMK-47X
VJB0442

CIRCUIT BOARD (VEP0442E)

P44

UDIO OUT	1
L AUDIO	2
USE MUTING	3
PB HIGH	4
	5


R448 33K
Q411 2SC1684
R438 39K
Q412 2SC1684
Q413 2SA683
R446 33K
R445 220
R456 10K
C438 50V1
R455 10K
R451 10K
R447 3900
D409 MA150
R452 33K
R453 22K
R454 18K
J6
J3
R444 33K
S401
S402
J1
J2
J3
J4
J5
Q409 2SC1684
Q410 2SA564
R443 10K
R460 10K
R441 470
MA150 ×2
D406
D401
C415 16V10
TP401
R427 220K
R417 15K
R418 10K
C417 6V100
C418 16V10
C416 16V10
D402
R419 33K
R416 27K
MA150×2
D403
R423 10K
R432 56
R415 39K
Q408 2SA564
R442 2700
R439 39K
P44
R440 3300
J4
MA150 ×2
D405
C427 0.01
TP402
R430 33K
D404
R425 2200
R422 4700
C421 16V10
P41
R424 47K
R429 33K
C436 16V47
C414 0.1
L402 2.2mH
C424 16V10
C423 16V 10
C422 50V 0.22
C420 16V10
C401 680P
Q402 2SC1684
R426 1000
R401 33K
P42
C434 70P
VCV0001
BIAS ADJ
P43
Q401 2SC1684
R414 10K
C413 16V10
C412 16V10
IC401 AN262
C425 16V220
R431 560
R402 3900
R420 4700
R413 5600
R412 1000
C426 16V47
R421 47K
C411 50V1
C433 0.0012 (DC630V)
C429 16V47
C419 0.01
C410 0.0056
C406 0.01
C407 16V10
C402 6V33
C404 16V10
L403 1mH
T401 VCT0090
R410 470K
C403 16V10
R406 180
R409 5600
Q407 2SA719
R434 39K
R435 3300
Q403 2SC1318
Q404 2SC1318
L401 1mH
R403 100K
R407 2200
R411 1M
C408 0.001
C405 0.033
R405 20KB
PB GAIN
R404 5KB
PB EQ
C430 6V100
R436 12K
C432
C431 0.0047 ×2
R433 4.7
GCMK-47X
VJB0442
A
B
C
D
E

J1

1	EE-VV SELECT
2	
3	
4	PB +12V
5	DELATED REC +12V

J2

1	+12V
2	REC +12V
3	REC +12V
4	GND
5	GND

P41

1	AUDIO HEAD(R)
2	AUDIO HEAD(GND)
3	AUDIO HEAD(W)

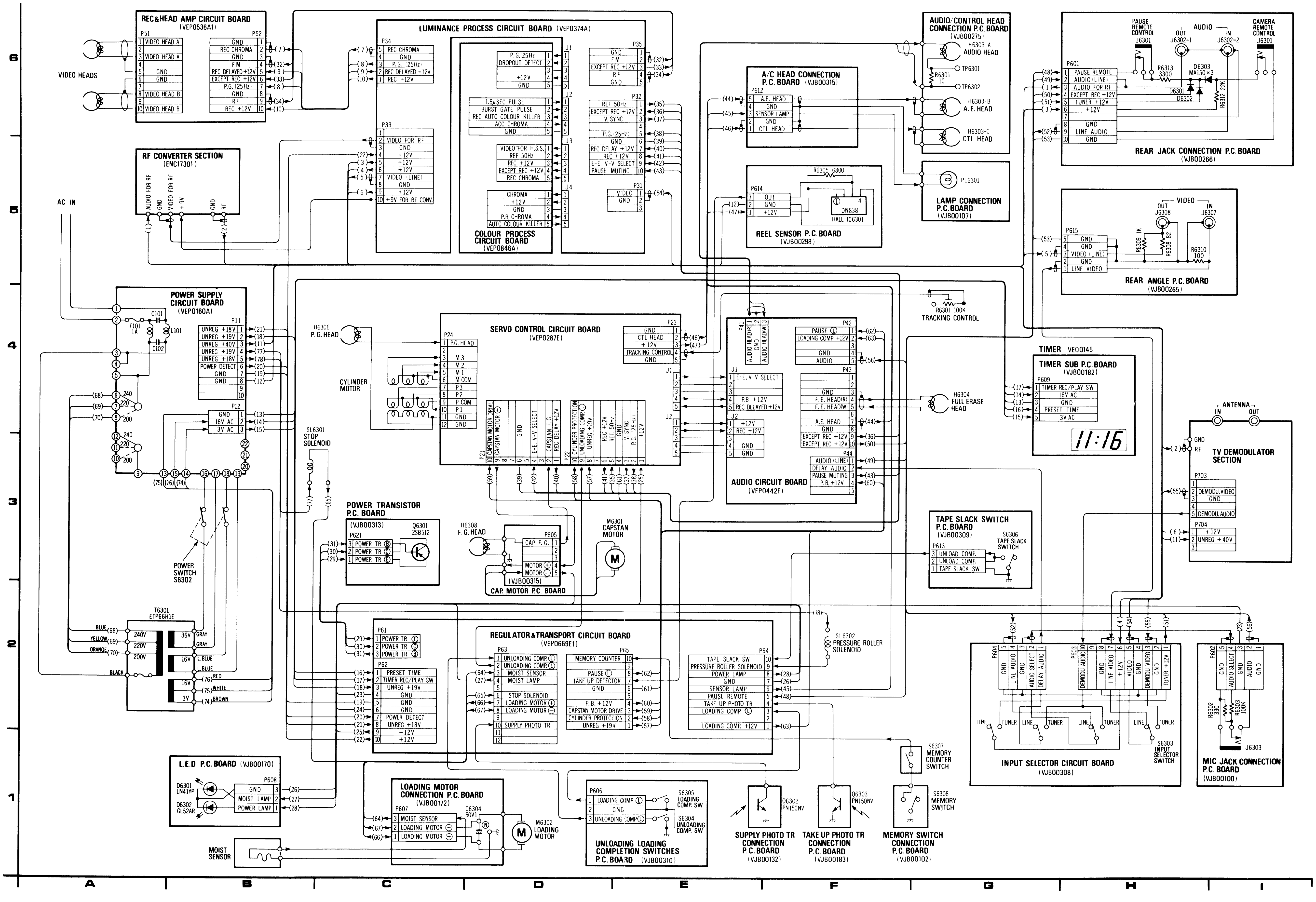
P42

1	PAUSE LOW
2	LOADING END
3	+12V
4	AUDIO IN (GND)
5	AUDIO IN

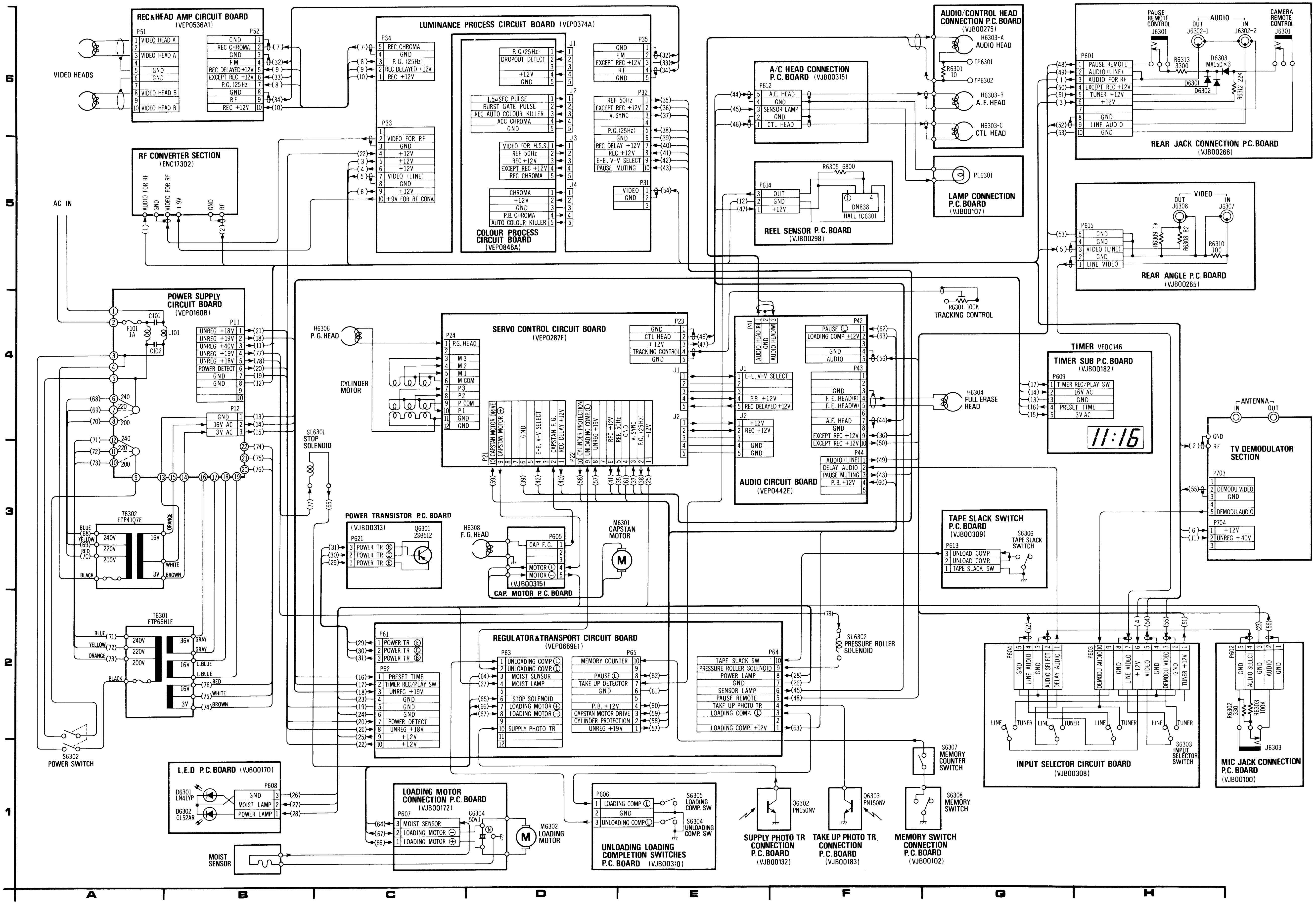
P43

1	
2	
3	FE.HEAD (GND)
4	FE.HEAD (R)
5	FE.HEAD (W)
6	
7	AE.HEAD
8	AE.HEAD (GND)
9	EXCEPT REC +12V
10	EXCEPT REC +12V

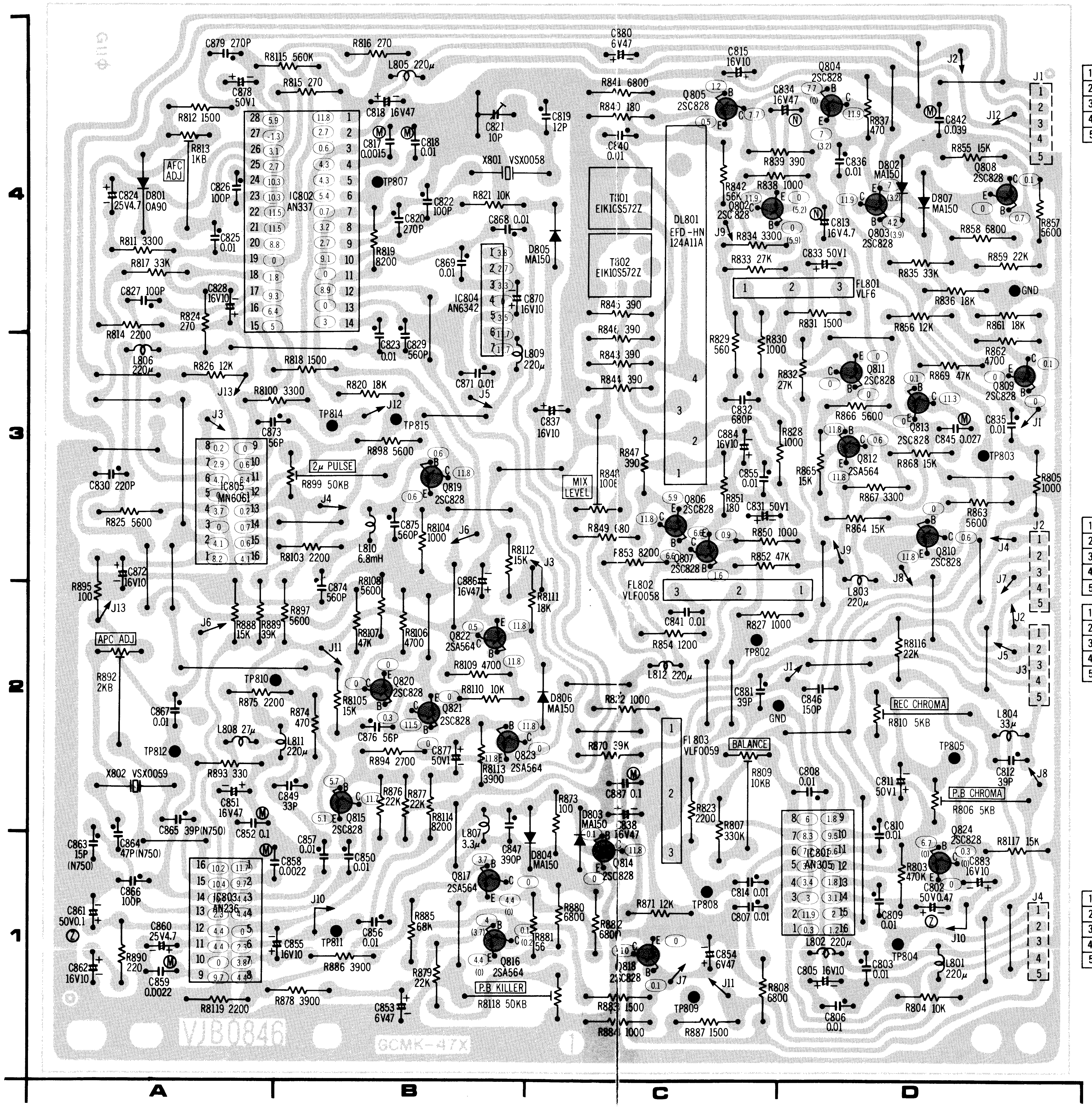
INTERCONNECTION SCHEMATIC DIAGRAM MODEL NV-8600-E


REC&HEAD AMP CIRCUIT BOARD (VEP0536A1)
P51
P52
VIDEO HEAD A
VIDEO HEAD B
GND
REC CHROMA
FM
REC DELAYED +12V
EXCEPT REC +12V
P.G. (25Hz)
RF
REC +12V
VIDEO HEADS
RF CONVERTER SECTION (ENC17301)
AUDIO FOR RF
VIDEO FOR RF
+9V
AC IN
LUMINANCE PROCESS CIRCUIT BOARD (VEP0374A)
P34
P35
P33
P32
P31
VIDEO FOR RF
+12V
VIDEO (LINE)
+9V FOR RF CONV.
P.G. (25Hz)
DROPOUT DETECT
1.5μSEC PULSE
BURST GATE PULSE
REC AUTO COLOUR KILLER
ACC CHROMA
VIDEO FOR H.S.S.
REF 50Hz
EXCEPT REC +12V
CHROMA
P.B. CHROMA
AUTO COLOUR KILLER
COLOUR PROCESS CIRCUIT BOARD (VEP0846A)
J1
J2
J3
J4
V. SYNC
REC DELAY +12V
E-E, V-V SELECT
PAUSE MUTING
VIDEO
AUDIO/CONTROL HEAD CONNECTION P.C. BOARD (VJB00275)
H6303-A AUDIO HEAD
R6301 10
TP6301
TP6302
H6303-B A.E. HEAD
H6303-C CTL HEAD
A/C HEAD CONNECTION P.C. BOARD (VJB00315)
P612
A.E. HEAD
SENSOR LAMP
CTL HEAD
PL6301
LAMP CONNECTION P.C. BOARD (VJB00107)
REEL SENSOR P.C. BOARD (VJB00298)
P614
OUT
R6305 6800
DN838
HALL IC6301
PAUSE REMOTE CONTROL J6301
AUDIO OUT J6302-1
IN J6302-2
CAMERA REMOTE CONTROL J6301
P601
PAUSE REMOTE
AUDIO (LINE)
AUDIO FOR RF
EXCEPT REC +12V
TUNER +12V
LINE AUDIO
R6313 3300
D6303 MA150×3
D6301
D6302
R6312 22K
REAR JACK CONNECTION P.C. BOARD (VJB00266)
VIDEO
OUT J6308
IN J6307
P615
R6309 1K
R6308 82
R6310 100
LINE VIDEO
REAR ANGLE P.C. BOARD (VJB00265)
R6301 100K TRACKING CONTROL
POWER SUPPLY CIRCUIT BOARD (VEP0160A)
F101 1A
C101
C102
L101
P11
UNREG +18V
UNREG +19V
UNREG +40V
POWER DETECT
P12
16V AC
3V AC
240
220
200
H6306 P.G. HEAD
CYLINDER MOTOR
SERVO CONTROL CIRCUIT BOARD (VEP0287E)
P24
P.G. HEAD
M3
M2
M1
M COM
P3
P2
P COM
P1
P23
CTL HEAD
TRACKING CONTROL
CAPSTAN MOTOR DRIVE
CAPSTAN MOTOR
CAPSTAN F.G.
CYLINDER PROTECTION
UNLOADING COMP.
P21
P22
SL6301 STOP SOLENOID
AUDIO CIRCUIT BOARD (VEP0442E)
P41
AUDIO HEAD (R)
AUDIO HEAD (W)
P42
PAUSE
LOADING COMP +12V
AUDIO
P43
E-E, V-V SELECT
P.B +12V
REC DELAYED +12V
F.E. HEAD (R)
F.E. HEAD (W)
A.E. HEAD
REC +12V
P44
DELAY AUDIO
PAUSE MUTING
P.B. +12V
H6304 FULL ERASE HEAD
TIMER VEQ0145
TIMER SUB P.C. BOARD (VJB00182)
P609
TIMER REC/PLAY SW
PRESET TIME
11:16
ANTENNA
IN
OUT
TV DEMODULATOR SECTION
P703
DEMODU. VIDEO
DEMODU. AUDIO
P704
UNREG +40V
POWER TRANSISTOR P.C. BOARD (VJB00313)
P621
POWER TR
Q6301 2SB512
H6308 F.G. HEAD
P605
CAP F.G.
MOTOR ⊕
MOTOR ⊖
CAP. MOTOR P.C. BOARD (VJB00315)
M6301 CAPSTAN MOTOR
TAPE SLACK SWITCH P.C. BOARD (VJB00309)
P613
UNLOAD COMP.
TAPE SLACK SW
S6306 TAPE SLACK SWITCH
POWER SWITCH S6302
T6301 ETP66H1E
BLUE
YELLOW
ORANGE
BLACK
GRAY
L.BLUE
RED
WHITE
BROWN
36V
16V
3V
REGULATOR & TRANSPORT CIRCUIT BOARD (VEP0669E1)
P61
P62
P63
P64
P65
UNLOADING COMP.
MOIST SENSOR
MOIST LAMP
STOP SOLENOID
LOADING MOTOR ⊕
LOADING MOTOR ⊖
SUPPLY PHOTO TR
MEMORY COUNTER
TAKE UP DETECTOR
P.B. +12V
UNREG +19V
PRESSURE ROLLER SOLENOID
POWER LAMP
SENSOR LAMP
TAKE UP PHOTO TR
LOADING COMP.
LOADING COMP. +12V
SL6302 PRESSURE ROLLER SOLENOID
INPUT SELECTOR CIRCUIT BOARD (VJB00308)
P604
P603
P602
LINE
TUNER
S6303 INPUT SELECTOR SWITCH
MIC JACK CONNECTION P.C. BOARD (VJB00100)
R6302 330
R6303 100K
J6303
L.E.D P.C. BOARD (VJB00170)
P608
D6301 LN41YP
D6302 GL52AR
MOIST LAMP
POWER LAMP
MOIST SENSOR
LOADING MOTOR CONNECTION P.C. BOARD (VJB00172)
P607
C6304 50V1
M6302 LOADING MOTOR
UNLOADING LOADING COMPLETION SWITCHES P.C. BOARD (VJB00310)
P606
S6305 LOADING COMP. SW
S6304 UNLOADING COMP. SW
Q6302 PN150NV
SUPPLY PHOTO TR CONNECTION P.C. BOARD (VJB00132)
Q6303 PN150NV
TAKE UP PHOTO TR CONNECTION P.C. BOARD (VJB00183)
S6307 MEMORY COUNTER SWITCH
S6308 MEMORY SWITCH
MEMORY SWITCH CONNECTION P.C. BOARD (VJB00102)
6
5
4
3
2
1
A
B
C
D
E
F
G
H
I

INTERCONNECTION SCHEMATIC DIAGRAM MODEL NV-8600-B


REC&HEAD AMP CIRCUIT BOARD (VEP0536A1)
VIDEO HEADS
LUMINANCE PROCESS CIRCUIT BOARD (VEP0374A)
COLOUR PROCESS CIRCUIT BOARD (VEP0846A)
AUDIO/CONTROL HEAD CONNECTION P.C.BOARD (VJB00275)
H6303-A AUDIO HEAD
H6303-B A.E. HEAD
H6303-C CTL HEAD
A/C HEAD CONNECTION P.C. BOARD (VJB00315)
LAMP CONNECTION P.C.BOARD (VJB00107)
PL6301
REEL SENSOR P.C.BOARD (VJB00298)
DN838 HALL IC6301
REAR JACK CONNECTION P.C.BOARD (VJB00266)
PAUSE REMOTE CONTROL J6301
AUDIO OUT J6302-1 IN J6302-2
CAMERA REMOTE CONTROL J6301
REAR ANGLE P.C.BOARD (VJB00265)
VIDEO OUT J6308 IN J6307
RF CONVERTER SECTION (ENC17302)
AC IN
POWER SUPPLY CIRCUIT BOARD (VEP0160B)
F101 1A
T6302 ETP41Q7E
T6301 ETP66H1E
S6302 POWER SWITCH
SERVO CONTROL CIRCUIT BOARD (VEP0287E)
H6306 P.G. HEAD
CYLINDER MOTOR
SL6301 STOP SOLENOID
R6301 100K TRACKING CONTROL
AUDIO CIRCUIT BOARD (VEP0442E)
H6304 FULL ERASE HEAD
TIMER VEQ0146
TIMER SUB P.C.BOARD (VJB00182)
11:16
ANTENNA IN OUT
TV DEMODULATOR SECTION
POWER TRANSISTOR P.C. BOARD (VJB00313)
Q6301 2SB512
H6308 F.G.HEAD
M6301 CAPSTAN MOTOR
CAP. MOTOR P.C.BOARD (VJB00315)
TAPE SLACK SWITCH P.C.BOARD (VJB00309)
S6306 TAPE SLACK SWITCH
SL6302 PRESSURE ROLLER SOLENOID
REGULATOR&TRANSPORT CIRCUIT BOARD (VEP0669E1)
INPUT SELECTOR CIRCUIT BOARD (VJB00308)
S6303 INPUT SELECTOR SWITCH
MIC JACK CONNECTION P.C. BOARD (VJB00100)
J6303
L.E.D P.C.BOARD (VJB00170)
D6301 LN41YP
D6302 GL52AR
MOIST SENSOR
LOADING MOTOR CONNECTION P.C.BOARD (VJB00172)
M6302 LOADING MOTOR
UNLOADING LOADING COMPLETION SWITCHES P.C.BOARD (VJB00310)
S6305 LOADING COMP. SW
S6304 UNLOADING COMP. SW
SUPPLY PHOTO TR CONNECTION P.C.BOARD (VJB00132)
Q6302 PN150NV
TAKE UP PHOTO TR CONNECTION P.C.BOARD (VJB00183)
Q6303 PN150NV
S6307 MEMORY COUNTER SWITCH
S6308 MEMORY SWITCH
MEMORY SWITCH CONNECTION P.C.BOARD (VJB00102)
A B C D E F G H
1 2 3 4 5 6

COLOUR PROCESS CIRCUIT BOARD (VEP0846A)


4
3
2
1
A
B
C
D
IC802 AN337
IC804 AN6342
IC805 MN6061
IC803 AN236
IC801 AN305
DL801 EFD-HN 124A11A
T801 EIK10S572Z
T802 EIK10S572Z
FL801 VLF6
FL802 VLF0058
FL803 VLF0059
X801 VSX0058
X802 VSX0059
AFC ADJ
APC ADJ
2μ PULSE
MIX LEVEL
BALANCE
REC CHROMA
P.B CHROMA
P.B KILLER
Q804 2SC828
Q805 2SC828
Q802 2SC828
Q803 2SC828
Q808 2SC828
Q806 2SC828
Q807 2SC828
Q809 2SC828
Q810 2SC828
Q811 2SC828
Q812 2SA564
Q813 2SC828
Q814 2SC828
Q815 2SC828
Q816 2SA564
Q817 2SA564
Q818 2SC828
Q819 2SC828
Q820 2SC828
Q821 2SC828
Q822 2SA564
Q823 2SA564
Q824 2SC828
D801 OA90
D802 MA150
D803 MA150
D804 MA150
D805 MA150
D806 MA150
D807 MA150
L801 220μ
L802 220μ
L803 220μ
L804 33μ
L805 220μ
L806 220μ
L807 3.3μ
L808 27μ
L809 220μ
L810 6.8mH
L811 220μ
L812 220μ
TP802
TP803
TP804
TP805
TP807
TP808
TP809
TP810
TP811
TP812
TP814
TP815
GND
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
VJB0846
GCMK-47X

1	PG(25Hz) IN
2	DROP OUT DETECT IN
3	
4	+12V IN
5	GND

1	2μ PULSE OUT
2	BURST GATE PULSE OUT
3	REC ACK IN.
4	ACC CHROMA OUT
5	GND

1	VIDEO IN(H S S)
2	REF 50Hz OUT
3	REC +12V IN
4	EXCEPT REC +12V IN
5	REC CHROMA OUT

1	CHROMA IN
2	+12V IN
3	GND
4	P.B CHROMA OUT
5	ACK OUT